Project Title: Is there a Mortality Differential by Marital Status among Women in South Africa? A Study on a Rural Sub-district of Mpumalanga Province in the North-East South Africa.

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A Project Submitted to the Faculty of Humanities, in Partial Fulfillment of the Requirements of the MA Degree in Demography and Population Studies, at the University of the Witwatersrand, Johannesburg.

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DECLARATION

I **Mercy Shoko;** declare that this research report is my own unaided work. It is submitted for the degree of Master of Arts in Demography and Population Studies at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination in any other university.

Signed: **Mercy Shoko**

Date: 1 July 2009

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Dedication

To Tanaka

Definition of Terms and ACRONYMS

ACRONYMS

CEDAW : Convention on the Elimination of all Forms of Discrimination
CI : Confidence Level
ADSA : Agincourt Demographic Surveillance Area
ICPD : International Conference on Population and Development
SADC : Southern African Development Community
STATSSA : Statistics South Africa
WHO : World Health Organization

Definition of Terms

Nonmarried: Divorced/Separated and Widowed.

Married: In a union, whether married or cohabiting.

Co-residence: if the husband is resident in the ADSA for a month or more then it is co-residence and not if less that 1 month.

Lobola: Bride price paid by the husband to the woman's parents at marriage.

Key Words

Married, Nonmarried, Co-residence, ADSA

Abstract

Using longitudinal data collected between 1999 and 2007, for Agincourt Demographic Surveillance Area, the paper examines the effect of marital status and co-residence on mortality of women who are aged between 20 and 80. The Cox Proportional Hazard Model is used to investigate the relationship between mortality and the covariates; marital status, co-residence, woman's country of origin and marital duration for married women. The number of months the husband was resident in the ADSA is used as a proxy for co-residence. After controlling for women migration, marital status and co-residence were significant. The divorced/separated and widowed women had a higher probability of dying compared to the married. In addition, being married to a migrant partner increased the woman's probability of dying. Thus the study concludes that marital status and co-residence affects mortality.

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Chapter 1: Introduction

1.1 Introduction

Women's overall health is an important subject not only because women are the majority in South Africa; constituting 52% of the total population (STATSSA, 2007), but also in light of the rapid increase in female mortality when compared with male mortality during the period 1992 and 2003, in Agincourt, which is the area under study (Kahn 2006). Coupled with this is the high prevalence of gender based violence in the country. There are loud cries from all corners of the country on upholding women's human rights and bringing an end to violence against women. In addition, gender equality and equity is entrenched in the country's constitution and the Government has endorsed several international agreements, namely the ICPD Programme of Action, Beijing Platform for Action, CEDAW and the SADC declaration on Gender and Development that have sought among other things to improve the health of women. Despite these measures that have been put in place there is alarmingly high levels of gender based violence with 55% of reported cases being women sexually abused by their intimate partners (Jewkes et al. 2004), and this has been confirmed to be a risk factor in HIV/AIDS transmission and the overall women's health, since coerced sex is known to increase the risk of micro-lesions which can occur during sexual intercourse (WHO 2002).

1.2 Problem Statement

Research has shown that married individuals have a health and mortality advantage over the other individuals in the other marital statuses (Waite 1995); Horwitz et al, 1996). This has been explained largely in terms of the psychosocial and economic support that is provided by each spouse to the other. However married women in Sub-Saharan Africa have high exposure to the risk of HIV/AIDS, largely due to socio-cultural factors that do not empower them, especially when negotiating safe sex with their partners if ever they do. This report seeks to investigate whether married individuals in South Africa experience lower mortality than the divorced/separated and widowed individuals as is apparent in Western countries. In addition a comparison is made of the married women who have varying degrees of co-residence. This is also in light of the decline in co-

residence time in married couples due to high levels of circular migration and high prevalence of gender-based violence in South Africa. It is imperative to investigate whether the notion that marital status affects health holds in a country with such prevailing social conditions.

1.3 Conceptual Framework

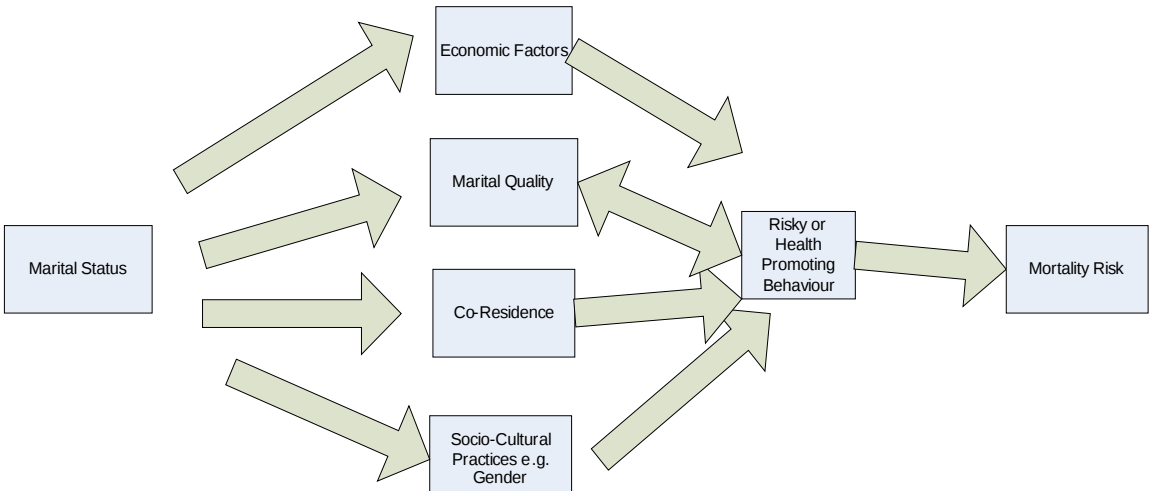

Figure 1: Conceptual Framework

Figure 1 above shows the conceptual framework of the study. Marital status is a background characteristic which works through economic factors, marital quality, gender and co-residence to influence the behavior of the individual. Risky or health promoting behavior then is the proximate determinant that influences mortality directly. Gender is a socio-cultural definition of how women must behave. In the African context; most women depend economically on men as a result may not have power to negotiate safe sex with their partners and may not walk away from unfulfilling marriages or if they discover that their partners are having extra marital affairs because they are socialized to believe that it is acceptable behaviour for men. This put the married women at a higher risk of contracting disease and eventual death especially with HIV/AIDS. Marital quality in as much as it influences behavior, behavior itself is also affected by marital quality. Economic factors as well as co-residence also interact with marital status to influence behavior of an individual.

1.3 Aim of the Study

The aim of this study is to investigate the relationship between marital status and mortality risk in women.

1.4 Purpose of the Study

The purpose of this study is to establish whether there is a difference in mortality with varying co-residence statuses of women. This is done by comparing mortality of married women whose partners are absent in the family for a period of time to those who live together almost all the time, and to non-married women.

1.5 Objectives of the Study

1.5.1. To compare mortality of the married and non-married women.

1.5.2. To compare mortality by duration of co-residence for the married women.

1.6 Research Questions

1.6.1 Is there a mortality advantage for the married women compared to the non-married or vice versa?

1.6.2 Does the migration of partners affect the mortality of women?

1.6.3 Is there a difference in mortality between married women who are co-residing with their partners and those with migratory husbands?

1.7 Hypothesis

1.7.1 Married women have a mortality advantage over their non-married counterparts.

1.7.2 Migration of a partner increases the probability of dying on the woman left behind in the area of origin.

1.7.3 There is a difference in mortality between married women who are co-residing with their partners and those whose partners who are temporary migrants.

1.8 Justification of the Study

Mortality is one of the important forces of population change and has been an area of interest for epidemiologists, demographers and social scientists and mortality differences between individuals and explanation for these differences have been an important focus for the social scientists and demographers in particular. There is a consensus that socio-

economic factors like gender, income, education, etc, are important predictors of mortality. In recent times there has been a growing interest in discovering whether marital status is an important determinant of mortality levels in individuals and there is a near consensus that married individuals have a health advantage over those in other marital statuses; divorced/separated, widowed or never married. Though extensive research has been done on the subject, most research has been done in the developed countries, and those done in developing countries were done in other continents like in the Matlab Surveillance DSA in Bangladesh which is in Asia. These areas already studied are fundamentally different from Africa and the research in Sub-Saharan Africa is particularly important because the continent bears the largest burden of HIV/AIDS: 67% of all people living with the disease and 72% of deaths due to AIDS in 2007 were in Sub-Saharan Africa (UNAIDS 2008). The HIV/AIDS scourge has also tended to reverse the gains that had been realized in terms of both the decline in mortality levels and improved life expectancy especially in South Africa, a country which has been hit the hardest by the pandemic (Kahn 2006).

Previous research has focused on sex, economic status, marital satisfaction, race and regional factors as mediating factors between marital status and health. This paper seeks to address the issue of marital status and health not only in light of the decline in co-residence of those married due to the high temporary migration which has characterized the country since the last century but also because of the high rates of gender based violence by intimate partners in the country. These factors have been well documented as risk factors for HIV/AIDS transmission which makes the study also relevant as it focuses on women, who are disproportionately affected by the pandemic. Of the total adult population HIV positive in South Africa, over 56% are women who are aged 15 and over (UNAIDS 2008).

1.7 Limitations of the Study

The study area, ADSA, being a former homeland, there could be selection effects: individuals might exhibit characteristics that may not be necessarily the same as the other married women in other rural areas in the country. As a result there are potential

problems with generalizing the findings. The study is also limited to those who had a union at one point in their life and therefore excludes those women who were never married. The study could also have been interesting and informative if it had also looked at the difference in cause of death for those who died. Due to a significant number of unknown causes of death for those who died, which has been exacerbated by the HIV/AIDS pandemic (Kahn 2006). As a result the report does not focus on the cause of death. The other important weakness is that as the report is based on secondary data, it means that the researcher has no control over the data and this may be a limitation on the variables one might use and analyses to be done.

Chapter 2: Literature Review

Marriage as an institution is declining either due to complete avoidance, or due to divorce and reluctance to remarry after marital dissolution (Waite 1995), or due to the increase in the singulate mean age at marriage over time which has been discovered in many countries including African countries (van de Walle 1993). Indeed the benefits of marriage have been under scrutiny in recent times (Horwitz et al. 1996). Interestingly, marriage however remains the central relationship for adults (Robles et al. 2003; Holt-Lunstad et al. 2008; Gallo et al. 2003). It is also distinctive, meaning that having a supportive network or living with someone does not moderate the effects of being single or unhappily married (Ross et al. 1990).

Gender Differences in the importance of marriage

Previous studies have looked at sex differences in health by marital status and there seems to be a consensus that marriage has great beneficial effects for health, though men derive greater benefits than women and consequently are worst affected by its dissolution (Rogers 1995; Thierry 2000; Wu and Hart 2002; Booth and Amato 1991; Williams and Umberson 2004). On the other hand, Gallo et al. (1995) asserts that while findings have confirmed that men benefit a great deal from being married, the findings have not however been consistent for women. Horwitz et al. (1996) however, argue that both men and women benefit from marriage.

Women becoming married may not have the same honeymoon effect as it seems to have for men (Williams and Umberson 2004). This is perhaps because any marriage entails its own stresses with initial benefits being offset by strains women encounter when adjusting their expectations and lifestyles to the realities of marriage (Ross et al. 1990).Thierry (2000) argues that men get most advantage from the services of their wives, while women depend less on men and they tend to confide in friends rather than their husbands when they have a problem, hence they suffer less from not living in a couple than men. A lot, it seems, is demanded from women than men and it is more than they anticipated. This seems to go back to the fact of the patriarchal nature of society where the women are

expected to perform all the roles inside the home, even in addition to their other roles outside the home if they are working. It is not the aim of this paper, however to compare the beneficial effects of marriage between men and women. It is important to note that though there could be a debate of who between men and women benefit more from marriage than the other, the majority of scholars agree that men as well as women do benefit from marriage (Robles et al. 2003; Waite 1995; Ross et al. 1990; Rogers 1995; Kohler et al. 2008) and it is from this scholarship that the study is premised.

Difference in marital status

Marital status is not assumed to have a direct effect on health behavior, but is mediated by psychosocial conditions and material circumstances (Joung 1997). In a study using Israel longitudinal data, Jaffe et al. (2007) found evidence to suggest that the effect of marriage gets stronger over time. This concurs with Tucker et al. (1996) in a study in America who asserts that consistently married people live longer than those who have experienced marital breakups. In contrary, Wu and Hart (2002) after controlling for possible selection and protective effects of a union found that staying in a union, whether married or cohabiting, generally results in poorer physical and mental health compared to those who remain single. It is important that in the same line, this report will be examining whether there is a mortality advantage with different marital duration but would not however look at the duration in an unmarried state. It will be interesting to compare survival with different marriage orders so as to examine this debate in South Africa. However because of the small number in the women with marriage orders higher than one, it will not be one of the covariates in this report.

Married women have mortality advantage over all the other marital categories; cohabiting, divorced/separated, widowed or never married. In a study that employed Dutch persons, Joung et al. (1997) found out that the married women experience the lowest mortality rates, divorced experience the highest and the widowed and never married have rates in between. Divorced women tend to have the highest incidence of risk factors like depression and smoking (Gallo 1995). Waite (1995) also argues that widowed women have better health than divorced women or those who have never

married, although they are still disadvantaged when compared to married women. Huie et al. (2002) found a two-fold risk of dying in those who have never married compared to those who are married. Rogers (1995) also found that the unmarried individuals were twice more likely to die compared to those who were married.

Effect of the transition from one status to another

Thierry (2000) argues that the transition from one marital state to another can be expected to produce phases of acceleration and deceleration in mortality independent of any selection effects. Thus according to Thierry, it is not the assumption of a new marital status but the transition from one status to another. Williams and Umberson (2004), Lee et al. (2005), Booth and Amato (1991), in studies in the USA, concur with Thierry; they argue that a transition out of marriage does not always undermine health and may in some cases improve it. Booth and Amato (1991), found evidence suggesting both health damaging and health promoting changes accompanying divorce and widowhood. Among non-smokers and past smokers women who divorced or widowed had more than a two-fold increased risk of relapsing/starting smoking. They also had decreased vegetable intake relative to women married, however they increased physical activity compared with women who stayed married, their body index decreased and those women who remained married had an increase in Body Mass Index, (ibid). In similar vein, Ross et al. (1990) argue that marriage exposes each other to infections and pollutants. In the same vein, Waite (1995) argues that some marriages produce no benefits and even cause harm to the women. This is particularly true with HIV/AIDS which gets transmitted from one partner to the other through sexual contact. It is also especially so in the African context in which women are economically dependent on men; that woman can not negotiate safe sex with their husbands. It is also unfortunate that the female condom has not received widespread publicity and has not addressed the sexual reproductive challenges women face. This does not mean however that the spread of HIV/AIDS is unidirectional, from the infected husband to the wife, as it could be both ways (Lurie 2003).

Marital dissolution is seen to increase depression among women (Wu and Hart 2002). Umberson (1987) also found much lower levels of unhealthy behaviors among the

married compared to the divorced and the widowed. Hanna (1993) and Horwitz et al. (1996) concurs with this view, he found out that woman who are married or have remarried decreased drinking, whereas those who became separated or divorced increased drinking. In similar vein, Horwitz et al. (1996), after controlling for premarital rates of mental health, in a longitudinal study, found that young adults who get and stay married do have higher levels of well-being than those who remain single. They reported less depression and fewer alcohol problems, though Umberson (1987) discovered a general lower rate of problem drinking for women regardless of marital status.

Some scholars make a distinction between the individuals who are married and those cohabiting. Waite (1995) argues that cohabitation has some but not all the characteristics of marriage and hence not all the benefits enjoyed by those married. This may partly explain the health and mortality differential in married women and those cohabiting in favor of the married. The cohabitation union is characterized by lower levels of commitment and uncertainty which makes the two individuals to be reluctant to make an investment in the union and this also affect the sexual satisfaction of those in cohabitations, and consequently compromised health when compared to those married. Wu and Hart (2000), however, found that there is no difference in health outcomes for cohabitation and married such that exiting either union seems to have similar effects, and tends to be associated with a decrease in physical health, mental health or both which might mean that there are health benefits for those cohabiting. This report will not however make a distinction of those married and cohabiting, they will both be referred to as married. This is because of the small number of those cohabiting.

Relationship between marital status and morbidity

Morbidity has also the same patterns with mortality, with married women having greater satisfaction with life and blood pressure dipping than single individuals (Holt-Lunstad et al. 2008). Marriage can be considered as a protecting factor, particularly in relation to mortality from cardiovascular diseases and external causes (Kalediene et al. 2007; Horwitz et al. 1996). Waite (1995) also argues that becoming married and staying married enhances mental health.

Selection or protection of marriage as regard to health

Researchers have sought to explain these marital disparities and there is a debate on whether marriage is selective or protective (Sheps 1961). The scholars who argue for the selection theory argue that healthy individuals are more likely to marry or remarry and less likely to experience marital dissolution than individuals with chronic cardiac or neurologic conditions or with other disabilities that affect life expectancy. In addition higher deaths are likely to be experienced in the lower socio-economic stratum. The other view is that marriage is protective, married women are less likely to engage in behaviors that increase their likelihood of dying and marriage offers benefits in terms of material well-being that enhances their survival (ibid).

In support of the protective effects of marriage, Rogers (1995) argues that marriage reduces risky behaviors and increases compliance with medical regimens. Those who are not married die due to drinking and smoking, risk taking behaviors, accidents, and chronic diseases such as diabetes that require regulated behavior or treatment. Waite (1995) argues that the married women exhibit lower levels of negative health behaviors than the unmarried and as a result exhibit lower risk of dying than those who have never married or whose marriage has ended. Umberson (1992), notes that the end of marriage lowers women's body weight and results in the reduction of sleeping hours and Espinosa and Evans (2008) found a heightened mortality rate for survivors in the years just after the death of their spouse, which might also suggest the protective effects of marriage and that its erosion due to marital dissolution or death of the other partner leaves the health of the survivor compromised resulting in their death until they get used to the new marital status.

Contrary to the protection theory suggested, Booth and Amato (1991) argue that if marriage had protective effects on health, the health disparities should be realized in all the marital categories. However they found out that negative health consequences of marital dissolution attenuate with time; psychological distress increases just prior to divorce, remains elevated for a few years and eventually returns to levels that are similar to those reported by continually married and this is also true for the continually widowed.

Thierry (2000) concurs with the above view: He says that the changes in marital status are responsible for a maximum differentiation in the mortality of individuals, whereas continuing presence in the same marital state is a factor of convergence. Wu and Hart (2002) contradict this view and argue that women who remain single have their health deteriorate and report an increase in depression. As stated earlier in the purpose of the study, this paper compares the mortality of married women with women who are not married but were in union at some point in their life.

Rogers (1995) questions the selectivity assumption and argues that if it explained the marital advantage, then the differences in mortality would vary with cause of death, with the mortality difference greatest among those who die of genetic diseases or at least diseases that predate the marriage. But research has proved that where there was a mortality difference between the married and the unmarried, the causes of death was social and behavioral related.

Marriage provides individuals with a network of help and support, with partners who rely on them and on whom they can rely on and thus provides a sense of meaning in their lives and a sense of obligation to partners, thus inhibiting risky behaviors and encouraging healthy ones (Umberson 1988 cited in Waite 1995). Married individuals experience less physical and emotional pathology compared with the unmarried because they have continuous companionship with a spouse who provides interpersonal closeness, emotional gratification and support in dealing with daily stress (Waite 1995; Coombs 1991). This brings to the next point of the quality of the union, especially bearing in mind that it might not be all unions that will bring these benefits to the two individuals in the union.

Effects of the quality of union on women's health

Recent studies have shown that, being married per se is not universally beneficial, rather, the satisfaction and support associated with such a relationship is important (Holt-Lunstad et al. 2008; Robles et al. 2003; Gallo et al. 2003; Horwitz et al. 1996). Both marital status and quality are important risk factor in health consequences, and marriage appears to confer health benefits for women but only when marital satisfaction is high

(Gallo et al. 2003a). Also, "*The inconsistencies highlighted earlier in the beneficial effects of marriage on women, is due to the fact previous studies have not considered marital quality in their analysis meaning that the positive effects of supportive marriages may be obscured in studies that assess marital status, due to the marked, negative impact of discordant marriages*" (Gallo et al. 2003a: 420). The argument above shows that the inconsistency found in the benefits of marriage does not necessarily imply that marriage is not beneficial to women. In addition, a decline in physical or mental health therefore may precede exiting a union depending on the quality of the union (Wu and Hart 2000). Holt-Lunstad (2008) found evidence to suggest that high marital quality was associated with lower ambulatory blood pressure, lower stress, less depression and higher satisfaction with life. On the other hand troubled marriages have negative health consequences (Robles and Kiecolt-Glaser 2003; Holt-Lunstad et al. 2008).

Gallo et al. (2003a), in a prospective investigation, compared cardiovascular risk profiles and trajectories of women who were married or living with partners and who had high relationship satisfaction with those of women with moderate relationship satisfaction and with those women who were single, divorced and widowed. Women in relationship with high satisfaction had lower levels of biological, lifestyle and psychosocial risk factors when compared with other groups. In addition, the women who are not in union showed worse lifestyle and psychosocial risk factors profiles compared to those in unions with greater satisfaction. Horwitz (1996), however, alludes to the fact that there could be reverse causation, that is, in as much as marital quality affects states of mental health, mental health could also affect marital quality.

In an almost similar study, the same author, Gallo (2003b), also examined whether women in satisfying marriages evidence lesser atherosclerosis relative to women in low-satisfying marriages and relative to unmarried women. Women in satisfying marriages had the least atherosclerosis in the carotid arteries and aorta, especially relative to those in low-satisfying marriages. Women in satisfying marriages also tended to show less rapid progression of carotid atherosclerosis relative to women in low-satisfying marriages. Women who did not have a partner had intermediate levels of atherosclerosis. Waldron (1988), Horwitz (1996), White (1991) found that marital conflict is associated with

depression for women. In a similar vein, Priegrson et al. (1999), noted that separated and divorced women from a discordant marriage were not more depressed and those separated from a marriage they had rated as harmonious increased their alcohol consumption. This points to the fact that marital quality is an important determinant of the health of the individual women both when they are in union or after the dissolution.

Booth and Amato (1991), Williams and Umberson (2004) and Joung et al. (1997) argue that differences in health appear to reflect the strains of marital dissolution more than they reflect the benefits of marriage. Joung et al. (1997) found out that health differences in women are almost solely due to excess morbidity among divorced women. Booth and Anita (1991) also argue that the health consequences of either entering or exiting marriage are dependent on the age at which these marital transitions and statuses occur. Remarriage has health benefits for younger women and negative health consequences for the older women. Williams and Umberson (2004) state that only the previously married appear to be psychological disadvantaged by being unmarried. This report will not however look at the mortality levels in the never married. Other scholars also bring out the issues of data artifact, where they suspect errors in classification of marital status in census figures or in death certificates (Sheps 1961). This is particularly so in cross sectional studies, this is not an important limitation however in this study because it employs longitudinal data.

Economic factors as a possible confounder of the effect of marriage on women's health

Recent evidence has also shown that much of the variation in mortality across the marital categories in women can be explained by economic factors (Rogers 1995; Waldron et al. 1996; Waldron et al. 1998; Gallo et al. 2003; Joung et al. 1997). Mortality is affected by socio-economic differences, a relation that has been widely studied in itself and is not connected to marital status (Rogers 1995). High incomes improve people's housing, health behaviour, and access to and quality of healthcare. Waldron et al. (1998) propose the role substitution theory whereby employment and marriage can substitute each other in beneficial effects on health. Both marriage protection and selection can only be observed among the unemployed women who did not have an alternative source of

financial resources and social support but not among women who are employed. In similar vein, Rogers (1995) argues that non-married individuals with high incomes experience lower mortality than married ones with lower income and those who are single and poor experience the highest mortality. High incomes improve people's housing, health behavior and access to and quality of health care. In a study in rural India, Chen and Dreze (1992) found out that the poor health and subsequent mortality in widows was a consequence of their social and economic marginalization and not purely because of the marital transition. If the economic argument is true then it means that marital dissolution when the husband dies, results in the decline in the household income. It is this decline therefore, that results in the compromise of the health of the widow (Thierry 2000). In fact, the health differences between the non-married and the married are reduced significantly when controlling for economic factors (Joung et al. 1997).

Married women as well as cohabiting individuals benefit from economies of scale, (Waite 1995). Marriage also increases material well being, income, assets and wealth as wealthier individuals are more likely to marry and is also true in cases where both partners are employed. The extra income can be used to purchase better medical care, better diet and safer surroundings which lengthen their life. Wu and Hart (2000) argue that a rise in household income increases women' self health, whereas remaining in poverty results in an increase in the level of depression. It is also important to note that for women specifically there is a consensus that their material well-being improves with marriage.

Effects of co-residence on women's health

Rogers (1995) argues that marital status differentially affects mortality but not in a social vacuum, there are important mediating factors. In the same vein, Waite (2002) says that the effect of marital status on health depends on household contexts and observes that married couples living together are the most advantaged. Co-residence of partners may therefore be another important mediating factor between marital status and mortality. This is therefore one of the key covariates in this paper, and as has been highlighted before; mortality risk will be compared between the married and the non-married and also

between married women with varying co-residence times with their partners. The varying co-residence is mainly due to the temporary migration of the husband.

Migrants are known to be more likely than non-migrants to engage in risky behaviour conducive to HIV infection (Brockerhoff and Biddlecom 1999). Migrants may feel anonymous, free from the social norms that guided their behaviour in their family community and culture (Anarfi 1993). In addition lonely people away from home may also be especially susceptible to peer pressure and result in them engaging in behaviours that they would not have engaged in at home (UNAIDS 2001). It is important to note that it is not only the migrant partner who is engaging in risky behaviours that make the couple to be susceptible to diseases especially in the period when HIV/AIDS pandemic is important but also the partner who is non migrant (Dladla et al. 2001). Women are most of the time left in the area of origin when men migrate to look for work and they talk about the need for social, sexual, financial and emotional support, all of which are frequently lacking in long-term stable relationships particularly when the partner is absent, ibid. Migration also increases the strain on marriages, divorce or abandonment as the men get other partners at the place of work, resulting in greater likelihood of providing little or no support and less frequent visits to the family, ibid. Brockerhoff and Biddlecom1999 state that the reason for additional partners for females is survival while for males is sex drive. It is also important to note that eventually the women might migrate to urban areas and the marriages of the women who had migrated with their partners might end in divorce, feeding the sex worker population, since women have few opportunities in the labour market, (Crush 2005, Jochelson et al 2001). This makes women vulnerable and put them at a greater risk contracting various STIs.

Chapter 3: Methodology

3.1 Introduction

The Lexis diagram below shows the period and the age of the women under study. The X-axis, from 1999 to 2007, is showing the years of study and making the total eight. The Y-axis shows the ages of women studied, between 20 and 80 years. The maximum year was 80 because we cannot entirely rely on the data after age 80 because of small numbers and imprecision in the data. _

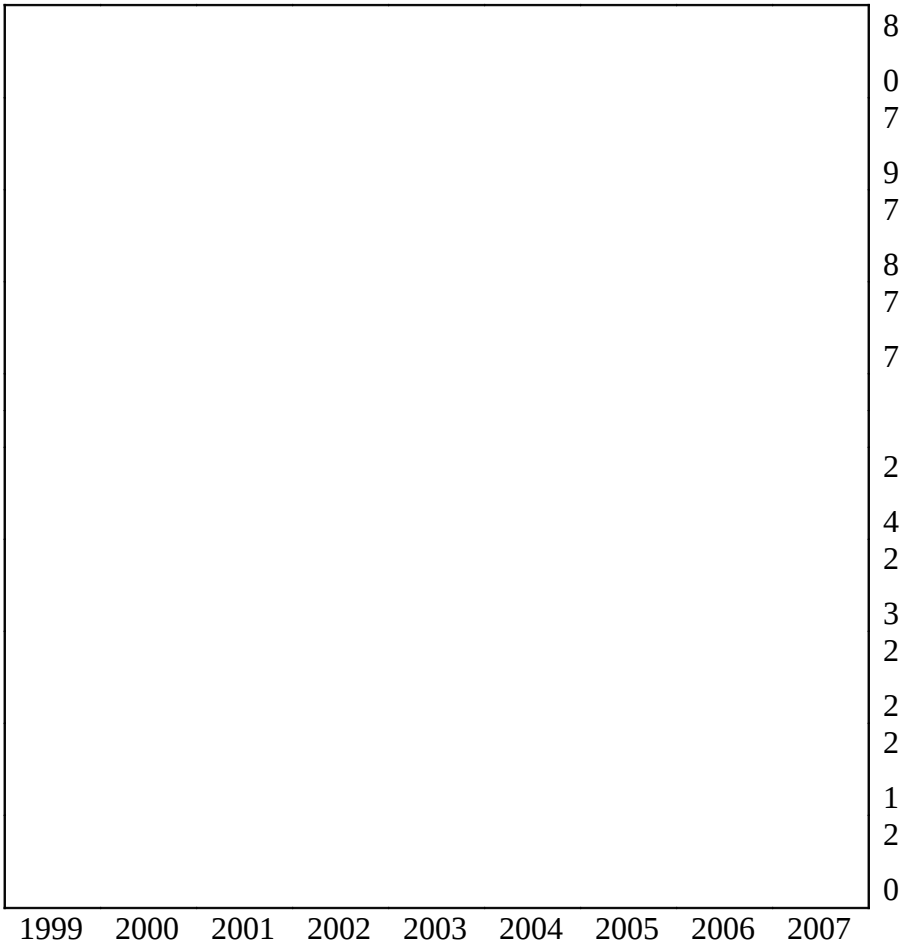

Figure 2: Lexis Diagram of Study

3.1 Source of Data

In the study, marriage histories, residence status and mortality data that were collected as part of the Agincourt Health and Demographic Surveillance are used. Palloni (2001) says

the actual understanding of mortality or health differentials, and, the causal inferences about mortality and health determinants require longitudinal data collection designs.

The baseline survey was done in 1992 and since then every year there is an update of the data by way of collecting data on the site. Among other variables deaths, births and migrations that occurred in the previous year are collected by trained interviewers. Data quality checks include duplicate surveying of a random sample of 2% of households; in addition a number of validation checks are built into fieldwork and the data entry process (Collinson and Adazu, in Cross et al. 2006).

Though there was data from 1992, the period of study is limited to 1999 and 2007 because the period from the late 1990s is important in that it saw an increase in all- cause mortality rate due to the HIV/AIDS pandemic. Also data on months the individual spent in the ADSA which is one of the key variables of interest, was collected every year since only.

3.2 Population

The site is a sub-district of Mpumalanga province in the north-east South Africa, close to the Mozambique border. Agincourt has approximately 70 000 individuals comprising roughly 11 500 households in 21 villages. The population density is about 175 people per square kilometer. The population included all the women who were married at some point, i.e. married, divorced/separated and widowed.

3.4 Variables and Variable Definition

The outcome of interest is death and the independent variables are current marital status, co-residence, woman's country of origin, and duration of union. Country of origin of the woman was divided into Mozambican, other nationalities and South African. Due to the small number in those who are not of South African and also not of Mozambican origin, a distinction was only made between South African and non-South Africans. Current marital status was restricted to those who were married at one point in their lives. The never married were not included in the study, though it could have been interesting to compare their mortality with the married and those who were no longer in union either

due to divorce/separation or because their partner was deceased. The report did not also focus on the marriage order though the researcher is aware that it may not mean the same risk of dying in people in second and subsequent marriage orders compared to those in the first order. However, because of the small proportion of marriage of order of two or more, the order was not tested. Duration of current union is defined by the period; (months or years), the partner was married for. It is important to note that this variable is restricted to those who are married only and does not include duration in the nonmarried state. It would have been interesting to differentiate between the mortality of the married women and those who are cohabiting. Unfortunately there were small numbers of those cohabiting as measured by whether lobola was paid and the researcher also adopted the South African Common Law Act which states that six months of consecutive cohabitation, is regarded as marriage.

Table 1: Summary of Event History Analysis concepts applied to the DSS Data

Where is the population under observation?	**How is the entry into observation defined?**	**Who can experience the event?**	**Is the event uniquely defined?**	**Is the censoring (truncation) reversible?**	**Is the censoring (truncation) uniquely defined?**
Spatial universe	**Entry time**	**Population at risk (risk set)**	**Event definition (transition)**	**Gap (temporary exit)**	**Loss (to follow-up), exit time**
Agincourt DSA	First entry (enumeration, in-migration) into the DSA during the period 1999 to 2007.	Women residing in the DSA who were in a union at one point in their lives.	Yes, death of the individual woman.	Yes, in case of circular migration.	Censoring event (death, year of last observation ; 2007; out-migration)

3.5 Data Analysis

Kaplan-Meier estimate with 95% Confidence Interval is used to plot the survival and hazard curves for women for descriptive statistics. For multiple regression, I use the Cox Proportional Hazard Model with bootstrap estimation of standard errors for time varying and fixed covariates to explore whether there is a relationship between mortality and the covariates: marital status, months the woman's partner is resident in the ADSA, country

of origin, and duration of union. Number of months the partner spent in the ADSA is used as a proxy for co-residence and the number of months the individual woman is resident in the DSA is used as a control variable of the exposure time in the DSA in the model.

Right censored cases are individuals during a specific year who did not experience the event of interest or who migrated out of the DSA before 2007. The left censored cases are those individuals who entered the DSA after 1999. The period under study is from 1999 to 2007, a period where there was increase in mortality in the country and rapid increase of female mortality in Agincourt DSA. Mortality for the women in the three marital categories (married, divorced/separated and divorced) is compared over the eight year period. All statistical analysis are done using STATA 9 package.

Chapter 4: Results and Discussion

4.1 Descriptive Statistics

There has been a steady increase of the total population of women in Agincourt as evidenced by the total number for each year in table 2; however the population sharply rises in 2007, and this is also true for the proportion married that sharply rises to 58.52%. This is because in 2007 the AHDSS was extended to include a few new villages. The 2007 results were therefore dropped because it could bias the results.

Table 2: Number of women aged 20 and over ever married by marital status 1999-2006.

Year:	1999	2000	2001	2002	2003	2004	2005	2006
Marital Status:								
Married	4,110	4,559	5,021	5,420	5,731	5,976	6,394	6,620
	50.09	*50.46*	*50.71*	*50.76*	*50.68*	*50.8*	*51.33*	*53.03*
Div/Separated	1,459	1,648	1,867	2,089	2,283	2,420	2,615	2,592
	17.78	*18.24*	*18.85*	*19.56*	*20.19*	*20.57*	*20.99*	*20.76*
Widowed	2,636	2,827	3,014	3,169	3,295	3,367	3,447	3,271
	32.13	*31.29*	*30.44*	*29.68*	*29.14*	*28.62*	*27.67*	*26.2*
Total	8,205	9,034	9,902	10,678	11,309	11,763	12,456	12,483
	100	*100*	*100*	*100*	*100*	*100*	*100*	*100*

According to Table 2 above, the proportion divorced has also steadily increased over the years from 18% in 1999 to 21% in 2006. This, however, might be an indication of the decline of marriage as an institution. On the other hand the proportion widowed has declined significantly from 32% in 1999 to 24% in 2006 although the total number, like with the married and divorced/separated has increased significantly over the years. The increase in numbers could be probably because of inmgration of individuals in the ADSA or due to HIV/AIDS deaths of partners in the case of widows. It is interesting to note that the proportion widowed, though steadily declining, is higher compared to the divorced/separated throughout the study period. This can also be explained by deaths due to HIV/AIDS complications in partners.

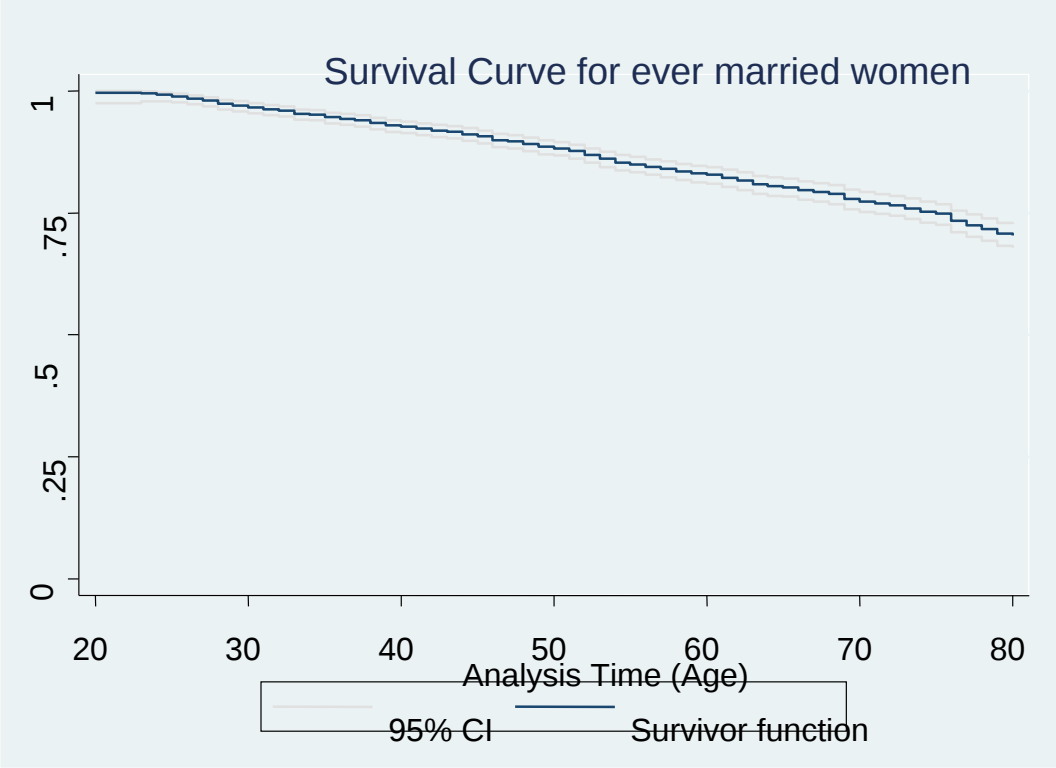

Figure 3: Kaplan Meier- Survival Curve for ever married women

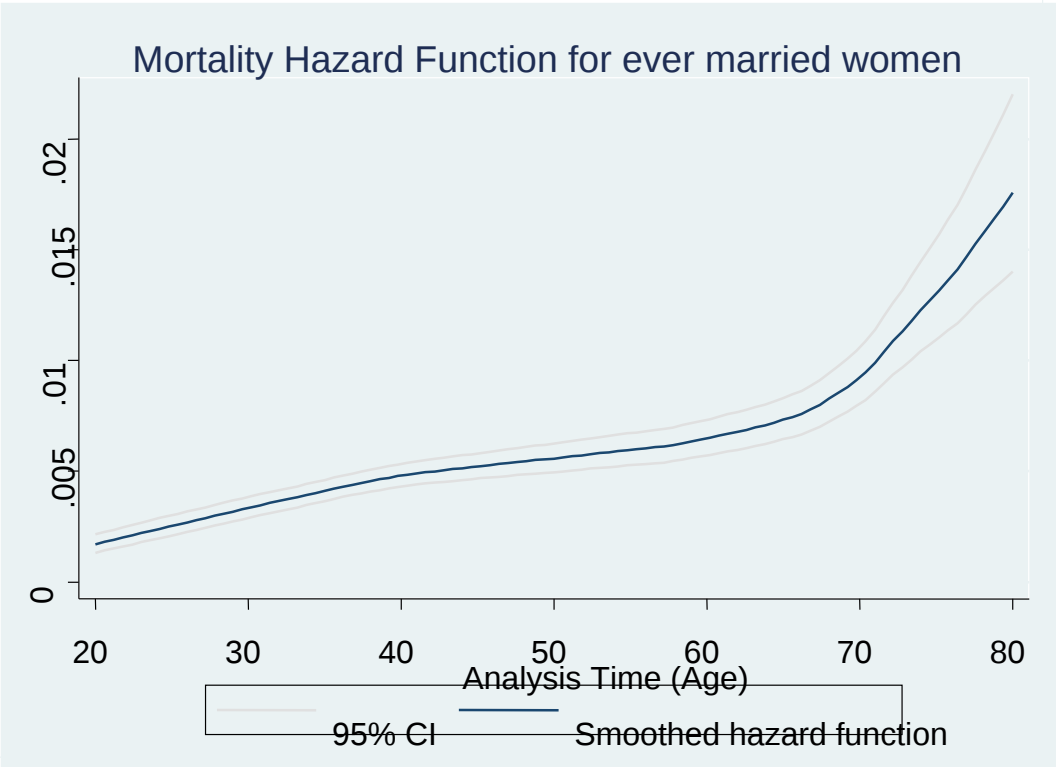

Figure 4: Hazard Function for ever married women

The Kaplan-Meier curve (Figure 3) shows the survival of women ever married in general regardless of their marital status, whether they are married, divorced/separated or widowed. The curve start off at 100% from age 20 and the probability of survival thereafter gradually decreases with increasing age to 75% at age 75. The results are significant as the 95% confidence interval is small. However the mortality appears to have been underestimated as we would expect a lower survival rate. StatsSA (2006) reported that the female mortality from 1999 through to 2004 has increased significantly; more than tripled for females aged 20 to 39 because of HIV/AIDS, nutritional deficiencies and other infectious diseases like malaria and tuberculosis. The estimated number of deaths rose from 354 000 to 431 000, 712 000 to 2 515 000, 796 000 to 4 153 000, 716 000 to 4 190 000 and 704 000 to 2 665 000 from 1997 to 2004 for ages 15-19, 20-24, 25-29, 30-34 and 35-39 respectively (ibid).

The hazard function curve (Figure 4) above showed the probability of dying at each age. The hazard curve shows that the estimated hazard risk occurring in women in Agincourt is generally low at age 20 and gradually increases to 5% a year at approximately age 40. As would be expected, the hazard risk steeply increases from age 70. The confidence internal (CI) of the hazard rates increases with age, particularly after age 70. Levels of mortality are too low across the ages compared to South African standards but the rise is expected.

The Kaplan-Meier curves (Figure 5) below show that the probability of survival is not very different for the widowed and divorced/separated. The married have a better survival prognosis compared to the non-married and though declining with the age of women (is expected) it is significantly higher. It is important to note that there is not a significant difference in the probability of survival until age 37 for the married and the widowed.

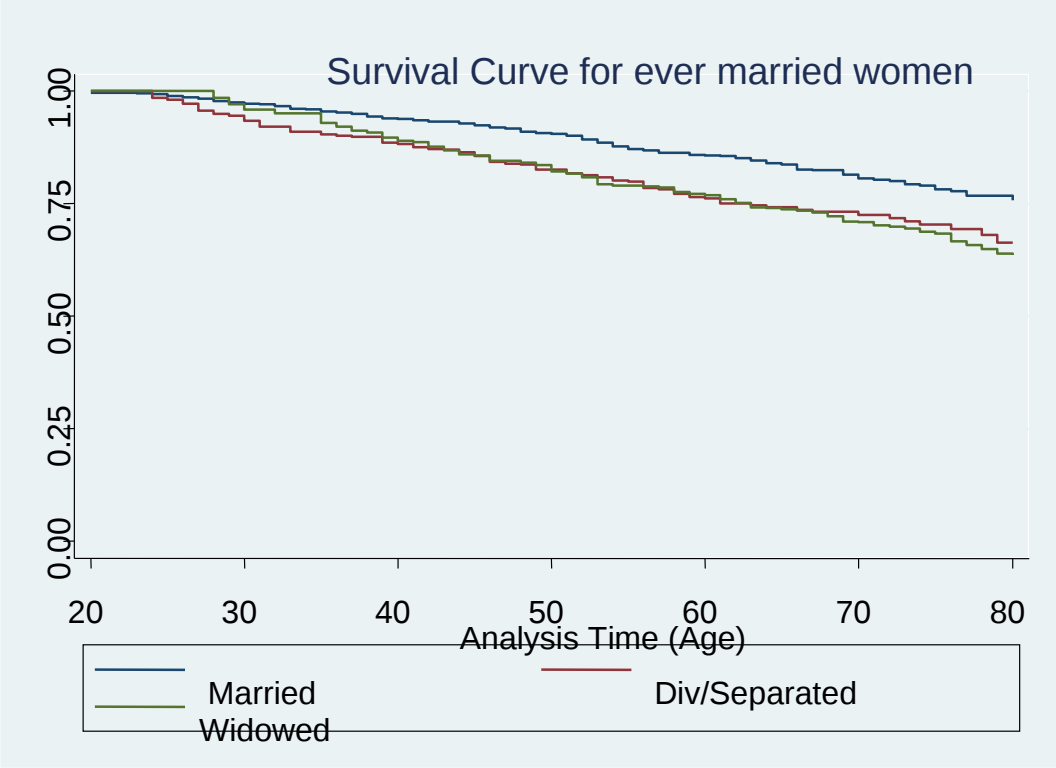

Figure 5: Comparison of Survival in Married, Divorced/Separated and Widowed

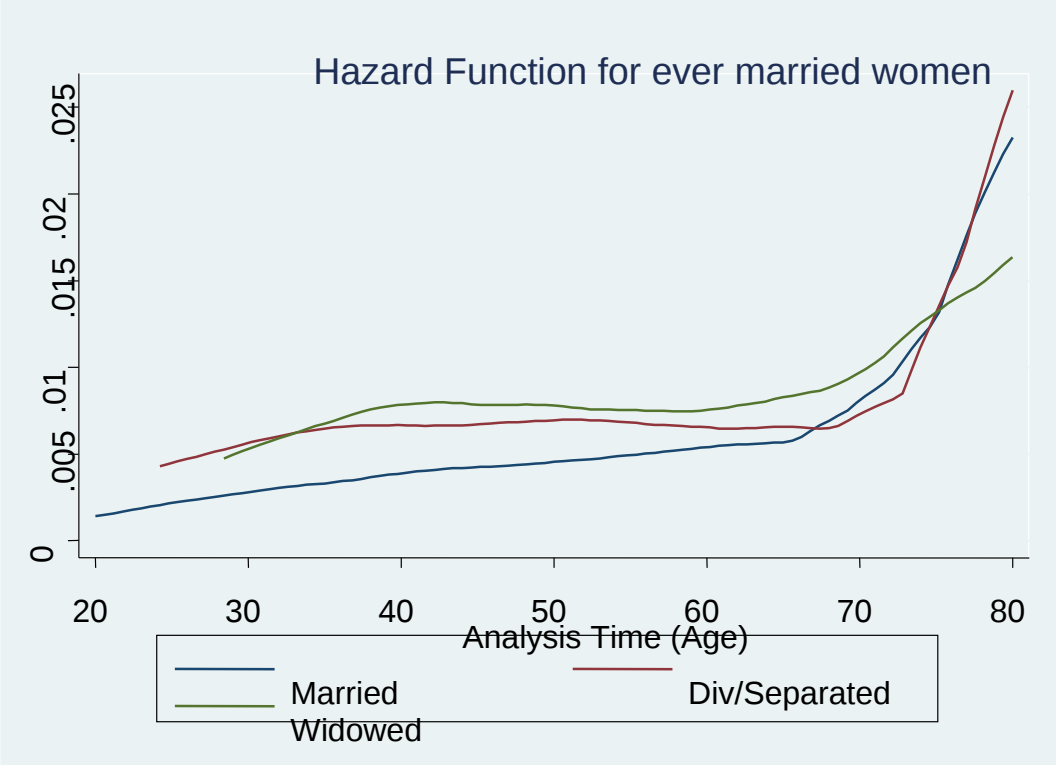

Figure 6: Hazard Function for the Married, Divorced/Separated and Widowed

The hazard function (Figure 6) above shows the hazard rate for the married is lowest between ages 20 and 68 and is significantly different from that of the divorced/separated and widowed. Interestingly, the hazard rate for the widowed is constantly higher than the divorced/separated between mid 30s and mid 70s. This is contrary to previous research that widowed women experience lower mortality compared to the divorced/separated (Waite 1995). This phenomenon could be related to HIV/AIDS where the widows' risk of dying maybe high if their husbands died from HIV/AIDS related complications. It is not however surprising that from age 68 the hazard rate for the married and the nonmarried sharply rise. This is because mortality generally is higher at older ages. After approximately age 75, the differences between the three categories are not significant.

Table 3: Comparing Probability of Survival on different Marital Status

Age-group	Total at risk	Died	Survivor Function	Standard Error	95% C I	
Married Women						
20-24	277	1	0.9964	0.0036	0.9747	0.9995
25-29	1546	9	0.9894	0.0043	0.9765	0.9952
30-34	2006	33	0.9719	0.0052	0.9597	0.9805
35-39	2004	37	0.9539	0.0059	0.9409	0.9641
40-44	1710	31	0.9381	0.0064	0.9242	0.9495
45-49	1405	24	0.9236	0.0070	0.9087	0.9362
50-54	1083	24	0.9054	0.0078	0.8890	0.9195
55-59	773	35	0.8704	0.0095	0.8505	0.8878
60-64	552	10	0.8571	0.0102	0.8357	0.8759
65-69	430	11	0.8372	0.0116	0.8129	0.8586
70-74	306	13	0.8060	0.0141	0.7767	0.8319
75-79	198	7	0.7814	0.0165	0.7471	0.8117
80 +	79	4	0.7568	0.0204	0.7139	0.7942
Divorced/Separated						
20-24	11	0	1.0000	.	-	
25-29	196	3	0.9800	0.0116	0.9385	0.9936
30-34	327	13	0.9337	0.0168	0.8917	0.9598
35-39	519	13	0.9041	0.0182	0.8616	0.9341
40-44	498	13	0.8818	0.0188	0.8392	0.9136
45-49	462	15	0.8557	0.0194	0.8129	0.8894
50-54	411	16	0.8249	0.0202	0.7813	0.8606
55-59	320	12	0.7981	0.0209	0.7533	0.8357
60-64	216	12	0.7608	0.0226	0.7131	0.8017
65-69	176	5	0.7410	0.0237	0.6911	0.7841
70-74	114	3	0.7249	0.0250	0.6725	0.7704
75-79	81	3	0.7029	0.0273	0.6457	0.7526
80 +	31	3	0.6633	0.0344	0.5910	0.7258
Widowed						
20-24	0	0	1.000	.	-	
25-29	29	0	1.000	.	-	
30-34	80	3	0.9584	0.0236	0.8759	0.9865
35-39	180	5	0.9295	0.0263	0.8555	0.9664
40-44	257	10	0.8900	0.0280	0.8205	0.9337
45-49	303	11	0.8566	0.0287	0.7893	0.9038
50-54	350	14	0.8216	0.0290	0.7561	0.8710
55-59	369	14	0.7904	0.0291	0.7264	0.8411
60-64	397	11	0.7680	0.0291	0.7050	0.8193
65-69	495	18	0.7369	0.0288	0.6754	0.7598
70-74	554	21	0.7083	0.0284	0.6486	0.7598
75-79	568	21	0.6834	0.0279	0.6253	0.7345
80 +	332	32	0.6372	0.0272	0.5813	0.6878

Table 3 above compares the survival function for women who are married, divorced/separated and widowed from age 20 at 5 year age intervals up to age 80. It is the table equivalent of the survival curve in Figure 5. The 95% CI does not overlap at age 40 for the married and the divorced/separated which means that the difference is significant. However at the same age the CI for the widowed and the divorced/separated overlap which means the difference is not significant. This is also true until age 80, the difference between the married and the divorced/separated is significant but not significant between the divorced/separated and the widowed. As would be expected, the probability of survival in all categories declines with age. To sum up, the results show that the married have a mortality advantage over the non-married.

The curve below is done to check whether the assumption of proportionality which is to be used in the Cox Proportional Hazard Model could be violated. The curves run parallel for most of the analysis time, except for the widowed before 37 years old (=ln(37)=3.6), when widowhood is not so frequent anyway. Also the assumption does not hold after 80 years old (=ln(80)=4.4), but we know that the data beyond this age cannot be reliably interpreted. In overall, the graphical test shows that the Cox model is adapted, though it must be said that this test is not ideal for time-varying covariate, i.e. when a woman can change marital status during observation time.

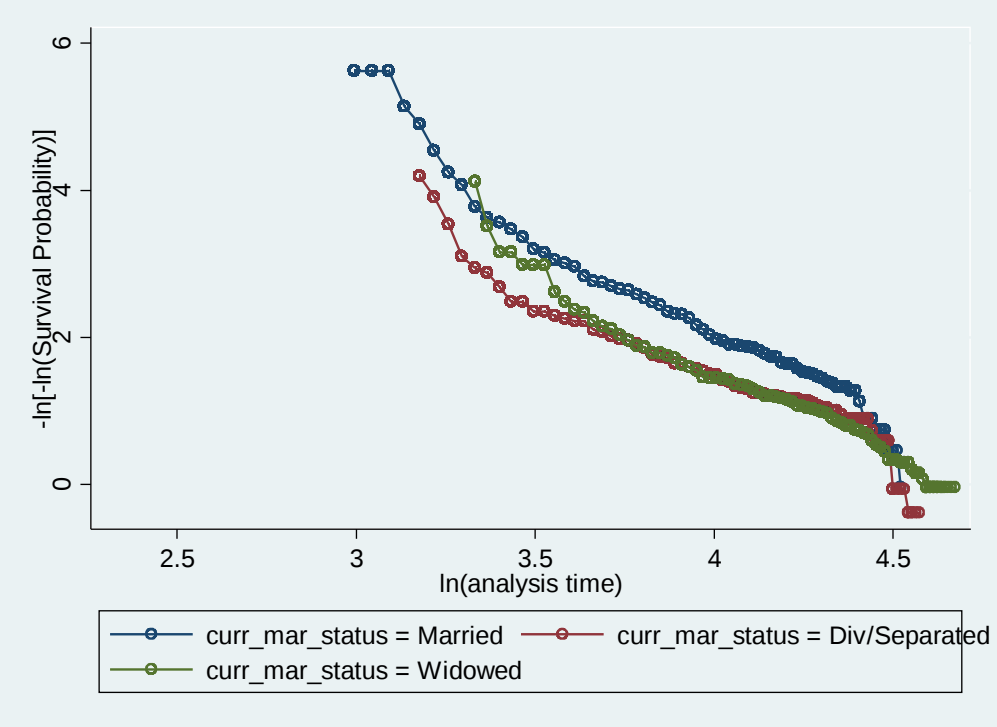

Figure 7: Checking Proportionality Assumption

4.2 Multivariate Analysis

In the multivariate analysis, we will control for the duration of residence of the women by including in the covariates this duration in months for every year. This is because at the descriptive level, the mortality hazard rates appeared to be too low as we could not take account of the exact period of residence in the DSA of the circular migrant women. However, in the Cox model, the variable 'Months the women are resident in the ADSA' will not be interpreted as such. It will only serve as a control variable, so that other covariates can be rightly interpreted, all duration of residence of the woman being equal.

Table 7: Results of the Cox Proportional Regression Using the Bootstrap Replications for Computation of Standard Errors

No. of subjects = 14561
No. of failures = 434
Time at risk = 88276
Wald chi2(28) = 87.68
Log pseudolikelihood = -3225.2842 Prob > chi2 = 0.0000

Marital Status	Hazard Ratio	Standard Error	Z -Value	P-Value	95% CI
Married	Reference Category				
Divorced/Separated	1.77	0.292	3.47	0.001	1.2823 2.44767
Widowed	2.03	0.387	3.72	0.000	1.3988 2.95085

Months the women are resident in the ADSA (Control variable for exposure in the ADSA)

Number of Months	Hazard Ratio	Standard Error	Z -Value	P-Value	95% CI
0 Months	2.99	1.194	2.76	0.006	1.3733 6.54253
1 Months	1.04	0.259	0.15	0.878	0.63748 1.69353
2 Months	1.22	0.285	0.86	0.390	0.77373 1.92987
3 Months	1.25	0.291	0.97	0.334	0.79395 1.97335
4 Months	1.34	0.511	0.77	0.444	0.6338 2.83101
5 Months	1.09	9.658	0.01	0.992	3.32 3.61
6 Months	1.95	13.669	0.10	0.924	2.13 1785771
7 Months	2.89	0.901	3.40	0.001	1.56586 5.32361
8 Months	0.93	7.581	-0.01	0.993	1.12 7748336
9 Months	3.47	1.255	3.43	0.001	1.70541 7.04598
10 Months	1.34	0.469	0.84	0.400	0.67641 2.66027
11 Months	1.62	0.654	1.19	0.236	073106 3.57317
12 Months	Reference Category				

Partner Resident Months in the ADSA

Number of Months	Hazard Ratio	Standard Error	Z -Value	P-Value	95% CI

0 Months	Reference Category					
1 Months	1.77	0.402	2.52	0.012	1.135805	2.766816
2 Months	1.2	0.266	0.80	0.423	.7723714	1.849937
3 Months	0.9	0.259	-0.38	0.702	.5085187	1.576921
4 Months	0.66	2.15	-0.13	0.898	.0010647	404.2733
5 Months	1.56	13.32	0.05	0.959	8.14e-08	2.98e+07
6 Months	1.01	22.21	0.00	0.999	4.10e-19	2.58e+18
7 Months	1.99	23.076	0.06	0.952	2.84e-10	1.40e+10
8 Months	0.85	17.83	-0.01	0.994	1.22e-18	5.93e+17
9 Months	0.76	16.331	-0.01	0.990	3.91e-19	1.48e+18
10 Months	2.99	1.394	2.34	0.019	1.195809	7.454418
11 Months	2.15	34.005	0.05	0.962	6.94e-14	6.63e+13
12 Months	1.00	0.2	0.00	0.997	.6769647	1.479227

Duration of Union

Union Duration	Hazard Ratio	Standard Error	Z -Value	P-Value	95% CI	
Union Duration	0.99	0.008	-0.59	0.558	0.97844	1.01183

Country of Origin Hazard Ratio Standard Error Z -Value P-Value 95% CI

South African	Reference Category					
Other	0.99	0.116	-0.06	0.954	0.79028	1.248502

The model, Cox Proportional Hazard Model with bootstrap replications explains a fair amount of heterogeneity in the population. Looking at each of the independent variables examined, the current marital status and the number of months that the woman and the partner is resident in the DSA, are significant and it should also be noted that for the variables which are important predictors of mortality in the woman, the hazard ratios are all greater than 1 and thus shows an increased risk of dying. The woman who has a partner who is resident for only 1 month has 1.77 higher chance of dying (95% CI 1.135805-2.76682, P= 0.012) and is also almost 2.99 times more likely to die (95% CI 1.195809-7.45442, P= 0.019) if their partner is in residence for 10 months. Being in residence for a month means that he is a temporary migrant who might be coming home during special holidays and vacations and is away from his wife for 11 months. The results show that migration does affect mortality and it does not matter where the partner spent most of the months residing, in the DSA or at another location. Either way it increases the likelihood of the woman dying. The partner who is only a month or two away from his usual place of residence may put the woman at higher risk of dying

because the temporary migration increases the chances of infectious disease, like HIV/AIDS, because they might be having second wives or extramarital affairs.

Dladla et al (2001) and Crush (2005) have noted that migration increases the strain on marriages, divorce or abandonment as the men get other partners at the place of work, resulting in greater likelihood of providing little or no support and less frequent visits to the family, and this might result in women getting additional partners for sexual, social, financial and emotional support. Our results also confirm this situation, but interestingly, when the partner resides away for 2 months, his wife has also greater chance of dying. That is worth further investigation to better explain the phenomenon.

It is also interesting to note that current marital status is the most important predicting factor of female mortality. The results show that women have higher chance of survival when married and the risk of dying increases by 1.77 when divorced/separated (95% CI 1.28-2.45, $P<0.001$) and by 2.03 when widow (95% CI 1.40-2.95, $P<0.001$) compared to the married (reference group). The results therefore concur with other studies that have been carried out in the developed world and Asia among other places.

The results show that the country of origin is not significant as a predictor of mortality. Also, the marital duration has no effect. This is contrary to previous research which shows that the benefits of marriage attenuate or diminish with duration of union (Jaffe et al. 2007; Lillard and Waite 1995; Tucker et al. 1996).

Chapter 5: Conclusion and Recommendations

The results show that marital status and co-residence are important determinants of mortality. The divorced/separated and widowed women have a higher likelihood of dying compared to the married and the difference is significant. Marital status works through co-residence to influence the behavior of the woman to influence mortality. Having a partner who is a temporary migrant increase the chances of the woman dying and it does not matter where the migrant spent most of their time, whether they are at the place of work or with the woman in the ADSA. Duration of union and country of origin on the other hand are not important factors in predicting mortality in women.

There is sufficient evidence to accept the following hypotheses;

i.Married women have a mortality advantage over their non-married counterparts.

ii. Migration of a partner increases the probability of dying in the woman left behind in the area of origin.

iii. There is a difference in mortality between married women who are co-resident with their partners and those with partners who are temporary migrants. Due to the longitudinal nature of the study, it was possible to measure the effect of current marital status, co-residence and mortality by controlling for confounding factors like residence of woman in the ADSA. However the study was not without its weaknesses. Duration of residence of the partner had an ambiguous effect because it did not have a continuous effect. Further research could be done using exact period of residence. Own study is not precise as to the mortality levels, because the exact population at risk could not be determined due to imprecision of data at hand mortality on temporary migration. In addition, data presented some inconsistencies e.g. data for 2007 that were sometimes difficult to explain. This might be due to the way the data was extracted and formatted.

The policymakers should be aware of the numbers of temporary migrants to enable them to plan accordingly for provision of not only health services.

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