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Iran as a case example**

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## **Reduction in global maternal mortality rate 1990-2012: Iran as a case example**

Hora Soltani, Frankie Fair, Sevil Hakimi

Out of a total of eight Millennium Development Goals (MDG) set by the United Nations, MDG5 aimed to improve maternal health worldwide. This was specifically aimed at reducing childbirth-related deaths for mothers by three quarters between 1990 and 2015. The total number of maternal deaths globally has declined by 45% from 523,000 in 1990 to 289,000 in 2013 (WHO 2014). This reduction, as an indicator of improving maternal health globally, is a remarkable achievement. There has however been wide variation in this improvement (WHO 2014) which needs thorough evaluation, individually and as a cross comparison, in order to extract constructive lessons to enhance the health of mothers, families and communities subsequently.

This commentary focuses on Iran, identified as one of the leading countries achieving the highest percentage reduction in maternal mortality ratios (MMR) since 1990 (WHO, 2014). Iran is a middle income country with a total population of over 76 million people, an annual population growth rate of 1.3% in 2012 and a total fertility rate of 1.9 (World Bank, 2012). About 69% of the population is urbanised (World Bank 2012). Iran has a controversial socioeconomic and political history, which has implications for maternal health and mortality. The reduction in maternal mortality has been reported to be 81% in Iran based on the 2010 World Health Organization (WHO) report and 72% based on a more recent WHO (2014) report. The variation in reduction is due to differences in the way the baseline maternal mortality was calculated (WHO 2014, p20). The maternal mortality ratio (MMR) in Iran in 1990 was estimated to have been 150 per 100,000 births in the WHO report 2010, but estimated to have been 83 per 100,000 births in 1990 by a more recent WHO report (2014). This variation in reported values shows the limitations of calculating maternal mortality ratios, especially in countries with no or limited systems to accurately record maternal deaths nationally. Even taking the more conservative estimate of 72% reduction from the most recent report (WHO, 2014), this is a considerable achievement, placing Iran 20<sup>th</sup> in the list of countries attaining or being close to reaching the 75% MDG5 target for reduction in maternal mortality. In this article, we examine possible contributing factors and future developments in continuing to reduce maternal mortality which is timely, given the need to maintain maternal and neonatal health improvements beyond 2015 (Van Teijlingen et al 2014).

Key contributors to the reduction of maternal mortality have been suggested to be education of women, access to (affordable or free) care including antenatal care, access to facilities (both in rural and urban areas) and timely transfer when required (Kuruvilla et al, 2014, Van Lerberghe et al, 2014). It is recognised that maternity care needs to be organised with good infection control and an ability to cope with emergencies, in particular postpartum haemorrhage which is the leading cause of maternal death worldwide (Say et al 2014). Skilled attendance at birth, particularly

well-trained midwifery and medical personnel, alongside adequate health facilities have also been shown to be important factors in reducing maternal mortality (Kuruvilla et al, 2014; UNFPA 2014). Long-term investment is therefore needed not just in health facilities but in training professionals, with regulation of the professions involved in maternity care to make them accountable for their actions also essential (Ronsmans et al, 200, Hoop-Bender et al, 2014). The other factor identified as important for reducing maternal mortality is access to family planning including legal, safe abortion services (Ronsmans et al, 2006, Kuruvilla et al, 2014). Each of these issues that contribute to improved maternal mortality will be looked at specifically in relation to Iran.

Progress has been made in the education of girls in Iran since 1990. There has been a large increase in the proportion of girls continuing in school until the last grade of primary school, rising from 65% in 1990 to 97% in 2011, with the percentage of girls progressing to secondary education also increasing from 66% in 1990 to 96% in 2011 (World Bank, 2012). The number of girls of primary school age across the country not enrolled in a school decreased significantly from 487,307 in 1990 to 112,387 in 2005 (World Bank, 2012). The number of women participating in higher education has also risen from 3.3% in 1986 to 18.4% in 2011, which in 2011 was slightly more than the 18.2% of men participating in higher education (Statistical Centre of Iran, 2011).

Since 1979, antenatal care has been provided free of charge in public facilities in Iran (Mehrdad, 2009). The number of women receiving at least one antenatal contact with a skilled attendant such as a midwife, nurse or doctor increased from 77% in 1997 to 97% in 2011 (World Bank, 2012), with 94.0% of women receiving at least four antenatal contacts in 2005. The number of births attended by a skilled birth attendant has also increased from 70% in 1989 (Heidari and Heidari, 2009) to 96% in 2011 (World Bank, 2012). It is reported that 95.3% percent of births are now 'Institutional deliveries' (UNICEF, 2013) taking place in maternity units either in public (governmental) hospitals, private hospitals or in rural birth facility units.

Iran has also seen improvements in another of the factors believed to be essential in reducing maternal mortality; access to family planning services. In 1989, 49% of married women in Iran practiced some form of family planning, by the year 2000 this had increased to 74% of married women, with 55% of urban and 57% of rural women using the oral contraceptive pill, requesting sterilisation, using intra uterine devices (IUD's) or barrier methods (Roudi-Fahimi, 2002; Abbasi-Shavazi et al, 2003). By 2011 usage had increased even further to 77% of married women of reproductive age (World Bank, 2012). In 2005 a law was passed allowing therapeutic abortion in certain circumstances (Larijani and Zahedi, 2006). Iranian women are also marrying at a later age, with the average age at marriage in 1986 of 19.7 years (Abbasi-Shavazi, 2000) and in 2011 of 23.4 years (Statistical Centre of Iran, 2011). These factors combined have contributed to the dramatic fall between 1990 and 2012 in the

total fertility rate in Iran from 4.8 to 1.9 and in the adolescent fertility rate from 90/1000 to 32/1000 adolescents (World Bank, 2012).

Life expectancy for females increased in Iran from 66 years in 1990 to 76 years in 2012 (World Bank, 2012). The general living standard as assessed through access to basic amenities has also improved. According to the Iranian census between 1986 and 2011 the number of houses with a bathroom increased from 46.8% to 95.2%, with piped water rose from 74.6% to 96.5% and with some electricity increased from 84.2% to 99.5% (Statistical Centre of Iran, 2011). Other economic markers increased within the same time period including the number of passenger cars per 1000 people rising rapidly from 17 in 2000 to 113 in 2008 and the number of mobile phone subscriptions per 100 people increasing from 0 in 1994 to 76 in 2012 (World Bank, 2012). These in addition to the improved state of roads, impact positively on transfer issues and facilitates timely referrals.

Across Iran the average health expenditure per person increased from 68US\$ in 1995 to 490US\$ in 2012, equivalent to 3.8% of Iran's gross domestic product in 1995 and 6.7% in 2012 (World Bank, 2012). Despite this increase in investment, differences in the standards of maternity care continue across Iran. One recent study found generally good compliance with commonly accepted recommendations for the third stage of labour management and postpartum haemorrhage prevention across Iran (Afshari et al, 2014). This could be one reason why the leading cause of maternal mortality in Iran in recent decades moved from haemorrhage to pulmonary embolism, eclampsia and amniotic fluid embolism (Moazzeni, 2013). However a massive discrepancy in access to facilities across the country exists, with over 90% of urban hospitals having onsite or on-call access to a blood bank, compared to 18% of maternity units in rural areas (Afshari et al, 2014). A further study in Khorram-Abad (a city in western Iran) found that although the quality of necessary delivery ward equipment compared to average national standards was excellent in both teaching and non-teaching hospitals, 100% and 97.2% respectively, physical aspects of the delivery ward such as ventilation, temperature and infection isolation rooms varied widely – being 41.6% compatible with Iranian standards in the teaching hospitals compared to 91.6% compatible in the non-teaching hospitals (Moosavisadat et al, 2011).

Improvements in institutional births and access to technology have led to an overall rise in the caesarean section (CS) rate from 35% in 2000 to 48% in 2009 (Bahadori et al, 2013). The CS rate varies widely between urban and rural areas (46.7% vs 27.6%) and between public and private hospitals (36.4% vs 64.3%) (Bahadori et al, 2013). The increased rate of CS has been met with concern (Soltani and Sandall, 2012), with the current Iranian CS rate well above the 10%-15% rate believed to be necessary to reduce maternal and neonatal morbidity (Gibbons et al, 2010). That increased CS rates impact upon maternal morbidity is clear, with the most commonly cited reason for a CS in Iran due to a previous CS (Badakhsh et al, 2012).

Countrywide death registration and a belief that maternal deaths are avoidable is one of the main factors believed to help countries address and reduce their maternal mortality rate (Ronsmans et al, 2006). The Iranian National Maternal Mortality Surveillance System was designed in 2000 and implemented in 2001 (Azemikhah et al, 2009). The aim of the system was to register all maternal deaths and identify the contributing factors leading to every maternal death. Interventions can then be implemented to prevent future similar deaths (Azemikhah et al, 2009). Although this is a step towards the right direction, a recent study suggested limitations in routine audit data collection in Iran which requires more attention (Afshari et al, 2014). Systematic audit data collection and reliable monitoring of mortalities and near misses locally and nationally, alongside establishing a culture of reflection without blame are crucial elements of a successful health improvement strategy.

This overview of factors impacting on maternal mortality from Iran is in line with other case studies (Van Lerberghe et al, 2014) indicating that multiple interweaving factors have contributed to the reduction in maternal mortality since MDG5 was published. The reductions in maternal mortality ratios, worldwide and at country levels are extremely important. However in-depth assessment of changes in relation to contributing factors is fundamental in allowing further improvement in maternal health. This includes consideration of the unintended consequences of an almost 50% CS rate given the morbidity and cost issues.

The inter- and intra-country diversity in maternal death and inequalities in maternal health remain strikingly high and should be addressed by involving researchers, practitioners, policy makers and more importantly women and their families. It is notable that globally, almost one third of maternal deaths occur in just two countries: Nigeria (40,000) and India (50,000) (WHO, 2014). India, for instance, is geographically close to Iran, being in the same continent (Asia), with a similar socio-demographic background. Cross-country comparisons are not within the scope of this article; however comparative evaluations and establishing joint regional and global forums to exchanges experiences seem to be appropriate in encouraging ways of addressing challenges and facilitators for a better global maternity care and health service provision. After all "every woman counts - even one preventable death is too many".

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