Trends in perinatal health indices in the Amajuba District, KwaZulu-Natal, South Africa, 1990 - 2012

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Background. In order to address the high perinatal mortality rate, South Africa (SA) commenced a number of interventions from 1995. These included the abolition of user fees, basic antenatal care, on-the-spot diagnosis and treatment of syphilis, and the prevention of mother-to-child transmission of HIV. However, there is a dearth of information on the long-term effect of these programmes on perinatal indicators in district hospitals, where most births and deaths occur.
Objective. To determine the levels and trends in maternal and neonatal indicators in Amajuba District, KwaZulu-Natal Province, SA, and to ascertain the dynamics of these indicators vis-à-vis the transformation of healthcare in SA.
Methods. The study location was Madadeni Hospital and its nine feeder maternity clinics. Information pertaining to all deliveries and their outcome from these health facilities from 1990 to 2012 was extracted from the clinical registers. Data were analysed using SPSS version 15.0 (IBM, USA). Quantitative variables were summarised as means, while qualitative data were expressed as proportions and percentages. The trends for each outcome variable for the entire study period (1990 - 2012) were analysed and presented as line graphs and tables.
Results. There were 154 821 live births and 4 133 stillbirths from 1990 to 2012. The overall mean values for stillbirth rate, perinatal mortality rate, neonatal mortality rate and maternal mortality ratio were 26.3 (standard deviation 5.6), 40.9 (9.6), 16.8 (4.7) and 114 (56.6), respectively. There was a general improvement in all the perinatal health indices in the early 90s, followed by a general worsening until the early 2000s, after which a consistent decline was noted.
Conclusion. The perinatal health indices in Amajuba District have followed a pattern similar to that found in the rest of SA: an increase during the late 90s to early 2000s, followed by a decline from the late second half of the first decade of this century.

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Globally, each year there are 0.5 million maternal deaths, 2 million infants die within 24 hours and there are 2.6 million stillbirths. Almost all (99%) of these deaths occur in low- and middle-income countries,[1,2] mainly as a result of scarcity of healthcare institutions; even where available, these facilities are typically overcrowded, understaffed and ill-equipped, resulting in poor-quality care.[3] Thus, in order to achieve Millenium Development Goals 4 and 5,[4] substantial improvements in delivery of healthcare services will be required. In order to address the issue of high perinatal mortality, South Africa (SA) implemented a number of interventions. These included the abolition of user fees, basic antenatal care, on-the-spot syphilis testing and treatment, and primary healthcare.[5-9]

Furthermore, in Amajuba District, the use of nasal continuous positive airway pressure commenced in 1996,[10] antenatal care was transferred to clinics in 2000, the use of nevirapine for the prevention of mother-to-child transmission (PMTCT) of HIV started in 2003. The other major developments occurred in 2009: care centres became baby friendly, a six-bed kangaroo mother care (KMC) unit was established, ambulance services were upgraded and the care centres obtained the Council for Health Services Accreditation of SA (COHSASA).

The paradox is that despite these developments, national reports indicate that progress towards reducing neonatal and maternal deaths is disappointing, and by the middle of the decade 2000 - 2010, SA was one of the few countries in the world with rising mother and child mortality.[3,11,12] As a result of considerable inequalities that still exist in SA with regard to access to quality healthcare,[3,13] the relevance of national averages to Amajuba District is not clear.

In this study, we therefore set out to use local information to evaluate services in Amajuba District. We documented and analysed the level and trends in neonatal and maternal health indicators, and examined them against the backdrop of the ongoing transformation of healthcare in SA.

Methods

Research design

This was a retrospective, descriptive study involving delivery of all babies of at least 500 g in the Madadeni Hospital and its nine feeder maternity clinics. The study period spanned between 1990 and 2012.

Study location

Madadeni hospital is located in the Amajuba District, KwaZulu-Natal Province, SA. It provides the main maternal and neonatal services to mostly rural and semirural communities in Amajuba District. The hospital and its feeder maternity clinics serve a total population of 500 000 people.

For most of this study period (1990 - 2006), maternal and neonatal bed space remained unchanged in Madadeni Hospital, which provided district-level care. Service was rendered by 4 - 6 medical officers in obstetrics and 1 medical officer in the Special Care Baby Unit (SCBU).

Changes in care were limited to increased use of prenatal steroids and magnesium sulphate, the establishment of a four-bed high-care unit in 1996, and a six-bed KMC unit in 2009. Between

1990 and 2009, admission to the SCBU was flexible, but from 2010 to 2012, only infants with strictly defined medical conditions were admitted.

Study technique

Data were extracted from the clinical registers of Madadeni Hospital and the nine feeder maternity clinics in its catchment area for the period 1990 - 2012. Infant information retrieved included weight at birth, place of birth, presence of perinatal asphyxia (Apgar score <7 at 5 minutes), exposure to syphilis (mother Wassermann reaction positive), presence of meconium-stained liquor and chorioamnionitis (foul-smelling liquor and maternal pyrexia). For the purpose of this study, these parameters were used to determine risk of syphilis, meconium aspiration syndrome and bacterial septicaemia. The outcome of the babies was also noted.

For each mother-infant pair, presence or absence of episiotomy, ruptured uterus and mode of delivery were noted. From 2003, the HIV status and use of antiretroviral (ARV) drugs for the PMTCT of HIV were also noted.

Ethical issues

The hospital medical manager gave permission for the study.

Data analysis

Data entry, validation and analysis were done using SPSS version 15.0 (IBM, USA). Quantitative variables were summarised as means (standard deviations (SDs)), while qualitative data were expressed as proportions and percentages. The trends for each outcome variable for the entire study period (1990 - 2012) were analysed and presented as line graphs and tables.

Results

There were 158 954 births in registered in Madadeni and its feeder maternity clinics between 1990 and 2012, of which 154 821 (97.4%) were live and 4 133 (2.6%) were stillbirths. Of the 158 954 deliveries in this series, 136 065 (85.6%), 20 664 (13%) and the remaining 2 225 (1.4%) were in hospital, the clinics and homes, respectively.

Perinatal indices

The overall mean (SD) values for stillbirth rate (SBR), perinatal mortality rate (PMR), neonatal mortality rate (NNMR) and maternal mortality ratio (MMR) were 26.3 (5.6), 40.9 (9.6), 16.8 (4.7) and 114 (56.6), respectively.

There was a general decrease in all the perinatal health indices in the early 90s, followed by an increase up until the early 2000s, after which a consistent decline was noted (Table 1, Figs 1 and 2). It is noteworthy that the decline in adverse perinatal outcomes was not smooth, as it depicts peaks and troughs.

There was a substantial decline in the perinatal indices as exhibited by the percentage changes, especially the MMR (Table 2).

The overall low birth weight rate and the stillbirth:neonatal death rate were 9% and 4.3%, respectively. The perinatal care index ranged between 3.3 and 6.8, with an average of 4.9. It declined in the early 90s and thereafter climbed up for the next 10 years until the second descent commenced after 2007.

Feeder clinics utilisation

Over the study period, there was a consistent drop in both the number of mothers seeking to give birth in the clinics (potential clinic birth rate) and the proportion of labouring women in the clinics who eventually delivered in those centres (actual clinic birth rate). Thus, the contribution of the clinics to the overall births in Amajuba District dropped from 24% in 1990 to 6% in 2012, accompanied by increased referrals from these care centres to the hospital. A sharp increase in the referrals was observed in 2000 (Fig. 3).

Table 1. Perinatal health indices by year

Year	SBR	PMR	NNMR	MMR
1990	24.6	35.5	13.0	97
1991	26.9	42.0	16.3	122
1992	28.4	39.0	16.5	39
1993	25.7	36.2	12.1	60
1994	22.6	35.8	14.5	46
1995	23.2	35.3	13.0	60
1996	20.0	37.0	20.5	70
1997	34.0	50.6	18.3	223
1998	29.2	44.4	16.6	141
1999	28.5	49.1	21.5	128
2000	30.2	50.8	22.0	129
2001	29.5	49.4	21.1	92
2002	37.3	54.5	19.9	128
2003	34.9	52.6	18.7	151
2004	34.0	55.8	26.0	175
2005	30.8	49.1	21.5	109
2006	26.8	48.1	24.1	184
2007	24.0	40.1	16.7	149
2008	18.8	32.1	14.6	182
2009	23.4	34.6	14.5	66
2010	18.8	25.5	10.7	79
2011	16.9	23.9	8.5	80
2012	18.6	24.6	8.0	26

Table 2. Percentage changes in perinatal and maternal indices over the study period

Parameter	Lowest, % (year*)	Highest, % (year*)	% changes†
SBR	17 (2011)	37 (2002)	–28
PMR	25 (2011)	60 (2004)	–32
NNMR	8 (2012)	27 (2004)	–70
MMR	25 (2012)	244 (2006)	–90

*Year of occurrence.
†Between highest and lowest indices.

Antenatal care

The mothers of 134 157 (84.4%) of the 158 954 births received some form of antenatal care (one or more visits), while the remaining 24 797 (15.6%) received none. As depicted in Fig. 4, 5% of the pregnant women who delivered in 1990 received no care, against 1.9% in 2012. Booking rate before 20 weeks generally remained low until early 2000. Hence, the antenatal care bookings before 20 weeks more than doubled when 1990 was compared with 2012 (13.5% and 30.5%, respectively).

Delivery and postdelivery events

Of the 158 954 deliveries, 136 065 (85.6%), 20 664 (13%) and 2 225 (1.4%) were in hospital, clinic and homes, respectively. The mode

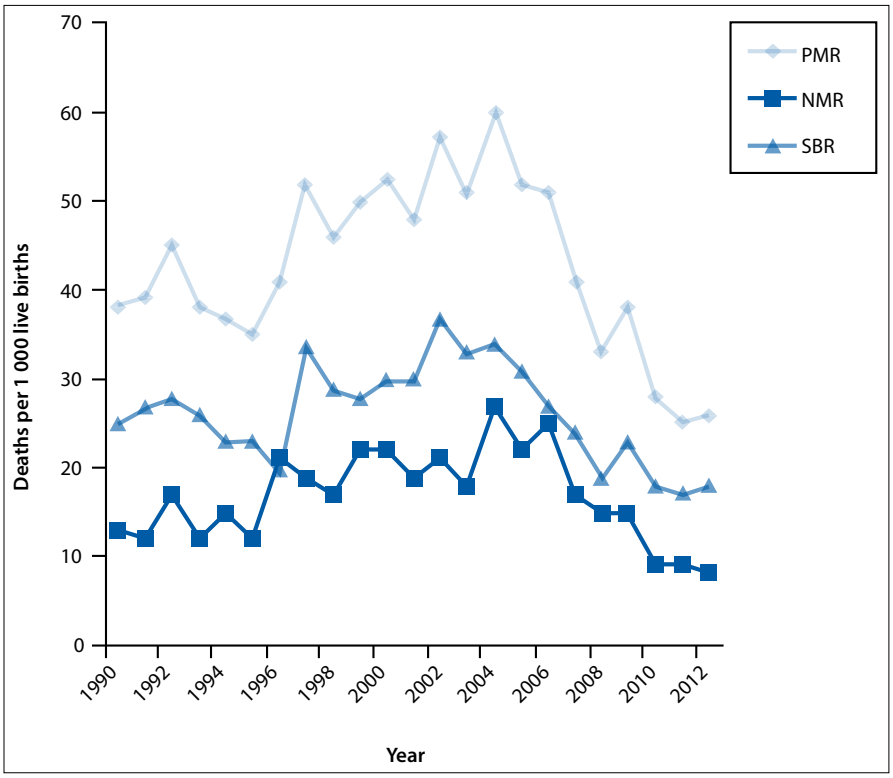

Fig. 1. Trends in perinatal health indices.

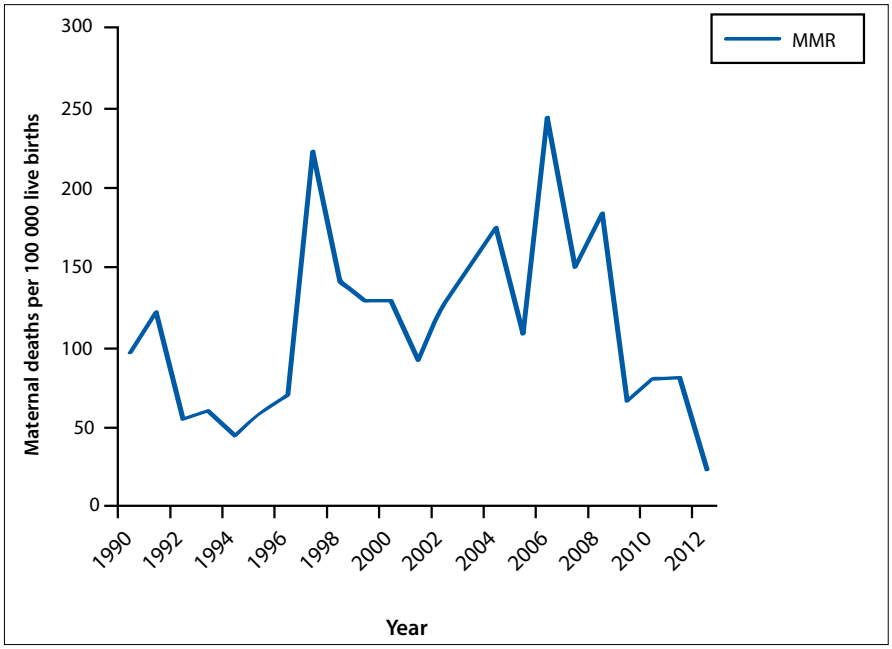

Fig. 2. Trends in maternal mortality.

of delivery was normal vertex delivery in 138 131 cases (85.8%), caesarean section in 21 691 (13.5%) and assisted in 1 110 (0.7%).

The episiotomy rate rose steadily until the late 1990s, when it began descending. The caesarean section rate varied marginally between 12 and 14% from 1990 to 2007, after which it rose to 19.7% in 2012 (Fig. 5). Also, from 2004, there has been no reported case of ruptured uterus. The risk of meconium aspiration rose steadily up until 2007, when it dropped sharply. Perinatal asphyxia had been increasing from 2.1% in 1990 to 6.8% in 2007, but in 2007 this began a descent and subsequently remained at values <5%.

Risk of non-pregnancy-related infections

Although overall infections showed a steady decline, syphilis showed an initial increase before plummeting after 1995 (Fig. 6). At the beginning of the PMTCT programme in 2003, only 7.3% of women attending antenatal clinics tested positive for HIV. By 2012, the percentage had increased to between 30 and 34%.

While only 3% of eligible HIV-positive women were on highly active ARV therapy as at 2008, the corresponding figure in 2012 was 90%.

Discussion

The current study indicated the need for continued efforts to use high-quality data derived from communities to monitor the state of obstetric and neonatal services in the communities.

Most births and deaths in SA occur in district hospitals, and, not infrequently, deaths result from substandard care.[3,5,13] Therefore, it is not surprising that in its quest for accelerated reduction in maternal and childhood deaths, the SA government implemented a series of quality improvement programmes to improve care in district hospitals. These strategies were monitored by two facility-based audits, namely the Perinatal Problem Identification Programme, and the Child Problem Identification Programme.[5] Unfortunately, large studies to evaluate the trend in perinatal indicators in district hospitals are not readily available, and thus healthcare workers often do not have baseline data to refer to.

It is with this in mind that we undertook this study, in which perinatal indices in a typical district hospital and its catchment primary healthcare centres were documented and analysed for the period between 1990 and 2012. Since the data represent hospital, clinic and home births, it is reasonable to assume that they are representative of Amajuba District and can thus be used as a barometer to measure the state of maternal and neonatal health in this district.

The major strength of this study was its large sample size, access to a mostly non-referral sample and use of maternity data to evaluate services within the district.

The striking overall finding revealed the wave-like fluctuation in perinatal indices, with two peaks and troughs; the 1990s witnessed the first decline in SBR, PMR and MMR, followed by a rise in these indices until after 2005, when another decline ensued.

It is noteworthy that the initial worsening of perinatal indicators up until after 2005 coincided with the peak of the HIV/AIDS epidemic in SA,[3,5] and the transition to better outcomes followed the intensification of the PMTCT programme and the widespread availability of ARVs to pregnant women and infants.[9,14] Current reports emanating

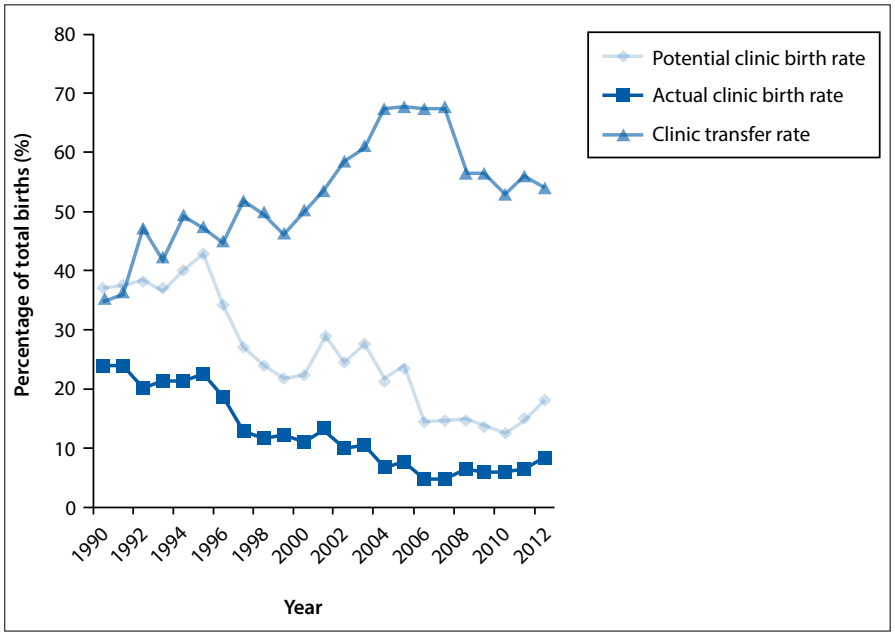

Fig. 3. Trends in clinic utilisation.

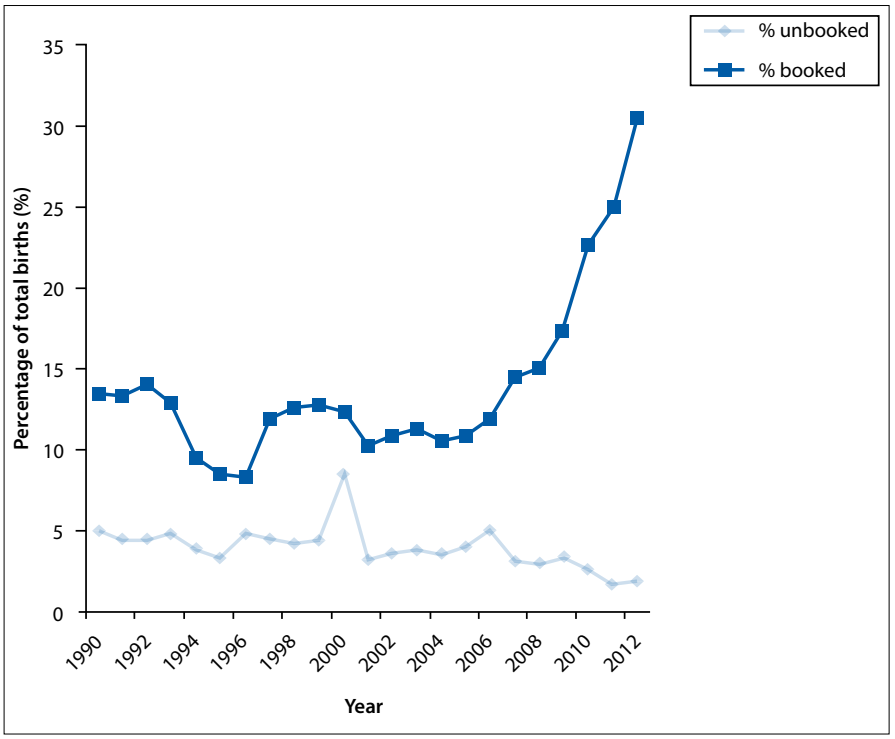

Fig. 4. Trends in antenatal care; booking refers to the percentage of mothers booking before 20 weeks' gestation.

from SA reveal that after years of rising childhood[15] and maternal mortality,[13,16-18] there has been a dramatic decline in deaths in the last 5 years, and the turnaround may be ascribed to rapid scale-up measures for the PMTCT programme and expanded rollout of ARVs to infected mothers and infants.

There are several other possible reasons for improved maternal and newborn health markers in this current study, including better management of an underperforming health system that was caving in under the pressure of the then HIV epidemic,[19] the consultant outreach programme,[20] better ante-, peri- and postnatal care,[10] improved ambulance services and thus a better referral system[21] (which led to improved patient flow to the hospital from the clinics and much-reduced clinic deliveries), a concomitant increase in the caesarean section rate and the decline in perinatal asphyxia.

Furthermore, in this study, there was no recorded case of ruptured uterus in the health facilities since 2003. This finding attests to the fact that more women in Amajuba District now have access to emergency obstetric care. It is unlikely that other risk factors for ruptured uterus, such as contracted pelvis, inappropriate use of uterotonic drugs and scarred uterus, have substantially changed during the course of this study.

Another notable finding in this report was that there was a progressive decrease in births in the clinics, as manifested by a decline in both the number of labouring women seeking initial care in the clinics, and the overall contribution of the clinics to total births in the Amajuba District. While patients side-stepping the clinics for hospital births may denote a weakness in the primary healthcare system, this change in behaviour of the population may have contributed positively to the overall decline in deaths, as more mothers were offered caesarean section towards the latter part of this series.

The perinatal care index over the entire study period was much higher than what was expected.[22] This seems to suggest that there is need for additional effort to improve the healthcare system and delivery within the district in spite of the apparent gains. However, averting further perinatal deaths will require knowledge of the major causes of neonatal and maternal deaths in Amajuba District, narrowing the gulf of socioeconomic quintiles in SA[23] and holistic, synchronised healthcare. All these are beyond the scope of this study.

Conclusion

This study of perinatal indices in Amajuba District revealed that there has been a reversal of the worsening trend that occurred during the 1990s, which was largely ascribed to the effect of the HIV/AIDS epidemic. The turnaround is as a result of various factors, such as improvements in comprehensive obstetric and neonatal care, the PMTCT programme and the overall elevation of the quality of care in our facilities.

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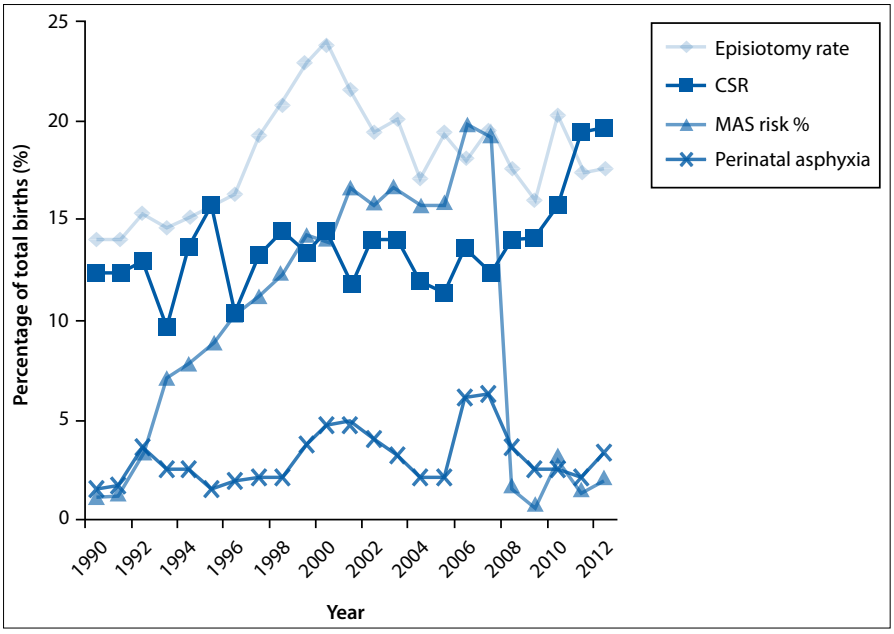

Fig. 5. Trends in delivery and postdelivery events. (CSR = caesarean section rate; MAS = meconium aspiration syndrome.)

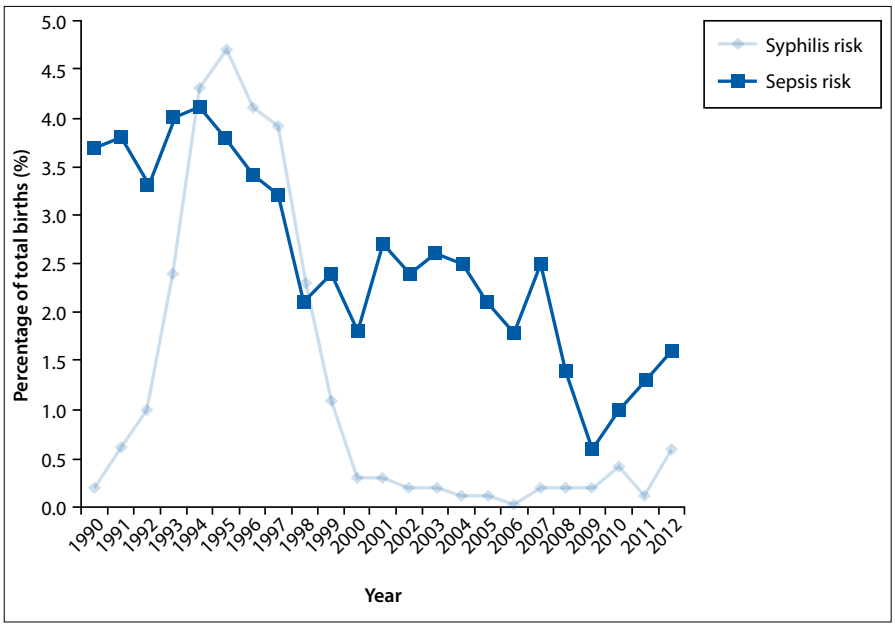

Fig. 6. Trends in peripartum infection.

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