

# Public Health Approach Towards Reduction in Maternal Mortality in South Asia

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**Abstract:** Globally, it has been estimated that every year over 500000 maternal deaths occur. Differing extent of political commitment has been observed in the implemented interventions for bringing about a significant reduction in maternal mortality. The current review is done with an aim to identify the socio-demographic factors and barriers which can affect antenatal care utilization. Further it explains all the possible approach which can be planned and implemented for delivering obstetric critical care in developing nations. Under Millennium Development Goal, the target is to decrease the maternal mortality ratio by three quarters between from 1990 to 2015. Some of the nations have shown good progress in achieving the goal while others have shown stagnation. Every parturient deserves special attention and care during antenatal, intra-natal and immediate post-partum period. The current review deals with the identification of the multiple socio-demographic factors and barriers which can affect antenatal care utilization. Further it explains all the possible approach which can be planned and implemented for delivering obstetric critical care in developing nations such as community participation, collaboration between different stakeholders, strengthening of referral services and infrastructure, inquiry into maternal deaths and integrated approach have been advocated in different settings with variable extent of success. To conclude, prioritizing among the identified challenges and barriers is the most effective method of bringing about desired health changes. In developing nations, for delivering obstetric critical care emphasis should be on socio-cultural characteristics prevalent in the local settings such as economic constraints, identified barriers, and attitude of family members towards institutional delivery.

**Keywords:** Maternal mortality, Developing nations, Antenatal care utilization, Referral services, Millennium development goal.

## 1. INTRODUCTION

Maternal and reproductive health began to attract attention of policy makers towards ensuring the well-being of pregnant females first in the 1980s when World Health Organization (WHO) launched the Safe Motherhood Initiative worldwide in which women's central role in development of society was acknowledged. Even in the 21st century, maternal health and wellbeing continues to remain one of the major health challenges worldwide [1]. Every parturient deserves special attention and care during antenatal, intra-natal and immediate post-partum period. Any unfortunate event leading to mortality in pregnant females raises a big question mark on the efficiency of public health system and functioning of health administrators [2]. In a multilevel analysis of promoting safe delivery in low and middle-income countries the role of health systems and planning & implementation of policies has been highlighted [3]. Disparities in the form of extent of political commitment, infrastructure support and manpower availability have been observed in the interventions implemented for bringing about a reduction in maternal mortality [4,5]. It has been

established on numerous occasions that the prevalence of maternal mortality is ten times more in developing nations as compared to the developed world [4,5]. In an online multi-country survey to identify World Health Organization (WHO) guidance priorities for all its member countries for the next five years starting from 2011, it was revealed that most of the countries have suggested the need of guidance on strategies focusing on 'quality of care' issues to reduce all-cause maternal mortality [6]. Major issues of concern identified in the survey were to devise measures for improving access / dissemination & implementation of effective practices and planning strategies for promoting education of health professionals [6]. The current review is done with an aim to identify the socio-demographic factors and barriers which can affect antenatal care utilization. Further it explains all the possible approach which can be planned and implemented for delivering obstetric critical care in developing nations.

## 2. MATERNAL MORTALITY

Maternal mortality is defined as the death of a woman during pregnancy or within 42 days after termination of pregnancy either by birth or by abortion or from any cause related to or aggravated by the pregnancy or management of the pregnancy [7]. More than half a million maternal deaths occur every year in

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the world [8,9], due to complications related to pregnancy or childbirth [10,11], most of which are preventable and manageable obstetric conditions [12-4]. Almost all maternal deaths (99%) occur in developing countries [11], and the risk of maternal deaths is 200 times higher in developing countries compared to developed ones [11,15]. In a study done in Bangladesh it was reported that 50% of maternal deaths occur within the first week after delivery due to delivery complications [16]. A review done in India revealed that the provision of quality maternal healthcare services can play an important role in reducing the maternal deaths [17].

### **3. MATERNAL MORTALITY: CAUSAL AND RISK FACTORS**

Maternal deaths often result from a variable range of direct and indirect complications during pregnancy and during and/or after childbirth. Direct causes like hemorrhage [18], hypertensive disorders (eclampsia) [19-21], puerperal infection [22,23], infections [24-26], and premature rupture of membranes [27], are the major contributors to maternal deaths in developing countries [18]. Indirect causes such as cardiac diseases [28,29], anemia [30], pulmonary diseases [31], malaria and acquired immune deficiency syndrome (HIV/AIDS) [30], account for 20 to 25% of maternal deaths. Findings of a systematic review revealed that hemorrhage was the leading cause of death in Africa and in Asia. In Latin America and in Caribbean region, hypertensive disorders were responsible for the maximum number of maternal deaths. Abortion related death was the leading cause in Latin America. Deaths because of sepsis were higher in Africa, Asia, Latin America and the Caribbean nations [18]. Other factors like healthy habits & poor awareness of hygiene [32], and global warming / climate changes have also been identified as the risk factors [33].

Socio-demographic parameters such as early maternal age [34,35], poor educational status [36], inadequate inter-pregnancy interval [37], poor economic status [38,39], and no adoption of contraceptive measures [40], have shown a positive association with rise in maternal mortality rate. In a research funded by Bill and Melinda Gates Foundation conducted across 172 countries it was concluded that use of contraceptive measures averted 272040 maternal deaths (44% reduction) when compared with that of 342203 maternal deaths in the year 2008 [41]. In a study to determine the trends of maternal mortality

ratio (MMR) in Nigeria it was revealed that the mortality ratio has more than doubled over a period of three decades and hemorrhage was the most common cause identified for maternal death [42].

### **4. MATERNAL MORBIDITY**

For every woman who dies of pregnancy-related causes, an estimated 20 women experience acute or chronic morbidity, often with tragic consequences [43]. Globally, 15-20 million women each year are estimated to suffer from postpartum and long-term morbidities / disabilities [44,45]. The scenario of maternal health and wellbeing in safe motherhood program in low-resource countries is often described in terms of maternal mortality alone, despite the fact that a large proportion of women suffer from morbidities associated with pregnancy and childbirth [46,47]. Many of these maternal morbidities and disabilities such as postpartum infection, anemia, perineal tears, urinary tract infection, depression, fistula, pelvic inflammatory disease and genital prolapse may arise during delivery or in the immediate post-partum period and can become chronic if not given due attention [43,45].

### **5. APPROACHES FOR MEASURING MATERNAL MORTALITY**

Cause-of-death information is an important planning tool for health services [48]. While civil registration systems that regularly record births and deaths are generally considered the gold standard for mortality data, these systems are absent, underdeveloped or incomplete in most developing countries [49,50]. In the absence of complete and accurate civil registration systems MMR estimates are based upon a variety of methods:

#### **5.1. Sisterhood Method**

For countries with high maternal mortality and fertility rates, an indirect sisterhood method for calculating maternal mortality indices was developed [51]. This method was first employed in the North Bank Division of The Gambia, West Africa, in 1987 [51]. In the sisterhood method, adult men and women report the proportion of their adult sisters (born to the same mother) dying during pregnancy, childbirth, or within six weeks following pregnancy [52]. The main objective of this method is to create a retrospective cohort of women at risk of pregnancy-related death, and to estimate the lifetime risk (the chance of a woman dying from pregnancy-related causes during her entire reproductive period) [53]. Utility of sisterhood method

has been acknowledged in African nations as well [54]. Sisterhood Method is not appropriate in countries or regions where the total fertility rate is less than 4 children per family, in areas of significant migration, during civil war / civil unrest [51-53].

### **5.2. Maternal and Perinatal Death Inquiry and Response (MAPEDIR)**

The Maternal and Perinatal Death Inquiry and Response (MAPEDIR) have been devised to assign cause of death through interview with family or community members, where medical certification of cause of death is not available [55]. MAPEDIR's genesis lies in UNICEF's Maternal Mortality Reduction Advocacy Project, supported by the United Kingdom's Department for International Development (DFID) [55]. It throws light on maternal deaths and provides actionable data to empower communities and local health systems [56]. The process of interviewing and being interviewed has contributed towards increase in awareness, among women, families and health personnel [56]. In Nigeria, it has been realized that improvement in the quality of maternal care is essential for achieving reductions in maternal mortality for which audit is one of the methods which can be used for both assessment and improvement in the quality of the services [57]. The biggest challenge towards smooth implementation of MAPEDIR is to acclimatize the interviewers with the questionnaire as most of them are not used to filling up of the questionnaire. From the family perspective, family members may have a defensive mindset because of fear of being blamed for neglect [55,56].

### **5.3. Reproductive-Age Mortality Studies (RAMOS) & Others**

A reproductive age mortality survey (RAMOS) was conducted to investigate the causes and contributing factors of maternal deaths in Kassala state, Sudan [58]. Other interim sources of maternal mortality data include vital registration with verbal autopsy, demographic surveillance systems, population census and population-based household surveys [59-61].

## **6. MILLENNIUM DEVELOPMENT GOAL 5A**

The Millennium Development Goals (MDGs) consist of eight international goals that were established in the Millennium Summit of the United Nations in 2000. All the 189 United Nations member states and at least 23 international organizations have agreed to work in

collaboration to achieve these goals by the year 2015 [62,63]. Under Millennium Development Goal (MDG) – 5A, the target is to decrease the maternal mortality ratio by three quarters between from 1990 to 2015 [62]. Some of the nations like Bangladesh, Egypt, Madagascar, Peru, Nepal, and Mexico, have shown good progress in achieving the goal as evidenced by the vital events registration [63,64]. On the contrary, many countries, especially in Africa and South Asia, such as Cameroon, Botswana, Chad, Congo, Lesotho, Somalia, South Africa, and Zimbabwe are not making progress [63,64]. In 2011, MDG 5A was achieved in Belize City by deployment of the world's first integrated countrywide health information system [65]. Another study reported that Iran has achieved a dramatic decline in maternal mortality ratio in concert with the significant reductions in total fertility and population growth rates [66]. Similarly, in Nepal, the maternal mortality ratio has been reduced by 48% within one decade between 1996-2005. Factors like promotion of facility delivery, presence of skilled birth attendant at the time of delivery, and intermediate factors (such as women awareness / family planning / safe abortion) have played a significant role in this observed decline [67]. However, the progress in terms of achievement of MDGs have not been encouraging in most of the Mesoamerican nations such as southern Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama [68].

## **7. PREGNANCY IN ADOLESCENT GIRLS**

Pregnancy at an early age is associated with greater health risks and increased incidence of complications / unsafe abortions in the mother [69,70]. Almost 16 million adolescent girls (15-19 years) give birth each year, accounting for roughly 11% of all births worldwide of which 95% births occur in developing nations [71]. In low- and middle-income countries, complications from pregnancy and childbirth have been identified as the leading cause of death among girls aged 15-19 years. Incidence of stillbirths and newborn deaths is 50% more among infants of adolescent mothers than among infants of women aged 20-29 years. Further, incidence of low birth weight is also much more among children of adolescent mothers [71]. Studies have revealed that in sub-Saharan Africa and South-Eastern Asia up to 10% of girls become mother by the age of 16 years [72,73]. In adolescents' pregnancy, major causes of concern are the health and nutritional status of the adolescent girls when they

conceive [74]. To counter the multiple concerns in adolescent girls, in India - Saloni Swasth Kishori Yojana scheme has been implemented to delay the age of marriage [75]. Similarly in the Tawana Pakistan Project implemented in selected rural districts of Pakistan, there is a provision of school lunch in primary schools to improve the nutritional status [76].

## **8. DELIVERIES BY TRAINED PERSONNEL**

All the pregnant females need access to antenatal care, skilled care during childbirth, and continuing care and support services after childbirth. It is of extreme importance that all births should be attended by skilled professionals, as timely management can make the difference between life and death [77]. The role of traditional birth attendants in conducting deliveries has been challenged again and again in developing and low-resource countries as they lack formal education or medical training and their clients end up with obstetric complications which lead to severe morbidity and mortality [78,79]. The global target is to achieve supervision of at least 90% deliveries by a skilled birth attendant (SBA) worldwide by the year 2015 as the presence of skilled health professionals to supervise deliveries has been identified as one of the key strategy for reducing maternal deaths [80,81].

In Pakistan, Ministry of Health's has launched a Lady Health Workers Programme with an objective to raise the health status of women and children in rural villages and poor urban areas. These lady health workers are educated up to 10 years of schooling, have no medical or nursing degree, but they do receive 3 to 6 months of training in primary health care and family planning [78]. Similarly in other countries different non-medical persons such as accredited social health activists (ASHA), village health guide, and outreach workers, etc. have been enrolled for delivering health care services who are being trained for a period of three-six months for carrying out their duties [82]. In most of the countries one worker is appointed to deliver healthcare services to 1000 people [78,82].

The biggest challenge in dealing with such a large load of critically ill obstetric patients is the shortage of qualified intensive care specialists for handling such cases in developing nations [83]. The challenge is not only related with difficulties in recruitment but also with retaining them especially in rural and remote areas [84]. The Indian public health system suffers from a severe shortage of specialists (37% positions of obstetricians are vacant) who have an indispensable

role in provision of emergency obstetrics care [82]. One of the study has estimated that despite concerted effort to increase SBA attendance there will be 130 to 180 million non-SBA supervised births in South Asia and sub-Saharan Africa from 2011 to 2015 (90% of these in rural areas) [85]. In response to a government-initiated intervention in 1000 counties in mid-Western China to give professional training to healthcare workers, MMR significantly decreased by about 50%, hospital delivery rate demonstrated a significantly rise [86]. Another systematic review has also revealed significant reductions in neonatal death and in maternal mortality [87].

## **9. ANTENATAL CARE UTILIZATION: IMPORTANCE AND DETERMINANTS**

Ante-natal care (ANC) services indirectly save the lives of mothers and babies by promoting and establishing good health before childbirth and in the early post-natal period [88]. Utilization of health services is a complex behavioral phenomenon. In a community based cross-sectional study conducted in Ethiopia to assess institutional delivery service utilization it was revealed that out of all deliveries, only 12.3% took place at health facilities [89]. Studies have found that institutional service delivery utilization was significantly associated with the age, residence, occupational and educational status of the mothers, and the occupational and educational status of the husbands as well as with distance from the nearby health centers, family size, parity, and ANC visit during the last pregnancy [89-91]. In a retrospective study conducted with an aim to compare the utilization of maternal and child healthcare services before and after the commencement of free maternal and child health care (FMCHC) in Enugu, it was concluded that maternal mortality reduced by 16.4% after implementation of the scheme [92].

With the ultimate goal of reducing maternal and neonatal mortality, many countries have recently adopted innovative financing mechanisms to encourage the use of professional maternal health services. In India, Janani Suraksha Yojana is a safe motherhood intervention being implemented with the goal of reducing maternal and neo-natal mortality by promoting institutional delivery among the poor pregnant women [93]. In Bangladesh a pilot voucher program was launched to provide poor women with cash incentives and free access to antenatal, delivery, and postnatal care, as well as cash incentives for providers to offer these services [94].

## **10. DELIVERING OBSTETRIC CRITICAL CARE IN DEVELOPING NATIONS: APPROACHES**

### **10.1. Community Participation**

Low-cost, participatory, community-based approaches involving women's groups has been proved to be effective in improving birth outcomes in different settings [95,96]. Different intervention strategies have been planned for engaging women's groups towards reduction of maternal mortality. Findings of a study revealed that a community participatory intervention provides a forum for communities to build a common understanding of maternal health hazards, as well as locally acceptable and sustainable strategies to counter the same [96]. These community participation activities can be planned in collaboration with self-help groups / non-governmental organizations for designing the customized interventions applicable in the local settings [96]. The intended benefits of greater involvement of community members have been well recognized as almost five-fold increase in population coverage was achieved in improving maternal and neonatal health in nine unions in rural areas of Bangladesh [97]. The benefits of this step were assessed with the help of cluster-randomized trial [97]. Community involvement has also been ensured in different countries by means of inclusion of women in delivering healthcare services to a specified group of population where she is easily accessible and acceptable as well [78,82]. Their impact has been assessed in terms of maternal mortality rates, infant mortality rate, number of deliveries conducted by skilled personnel, and number of institutional deliveries. Also, Department of Reproductive Health and Research has emphasized a combination of facility and community-based approaches in association with strong political will and multi-stakeholder involvement for reduction in maternal mortality [98].

### **10.2. Enabling Collaboration with Different Agencies**

#### **10.2.1. Public-Private Partnerships**

A public-private partnership (PPP) is usually a government sector service or a private sector project which is funded and operated through a mutual partnership between government and one or more private sector firms [99]. In India, under National Rural Health Mission, there is a provision of promoting public private partnerships to achieve efficiency and equity [99]. A recent such initiative focusing on provision of emergency obstetrics care in India is the Chiranjeevi

Yojana in Gujarat state which is a contracting out model with voucher based financing [100]. In a facility survey conducted in all secondary and tertiary public health facilities in three heterogeneous districts in Maharashtra state of India it was concluded that there is an immense need of contracting-in of the private specialists for emergency obstetrics care [101]. Similar results have also been obtained in a systematic review [102].

#### **10.2.2. Moving Ahead with Support of International Agencies**

Working in collaboration with international health agencies, World Health Organization (WHO) has developed a package of health interventions - family planning, safe abortion care, maternal, newborn and child health - to be delivered at community/primary health care/ and referral level during a continuum that will extend from before conception to postnatal period [103]. Based on the maternal health needs, policies have been devised in agreement with the national protocols to address social, cultural and financial factors that affect access to care and for ensuring timely referral and management of complications. Different international agencies can work in collaboration for warranting availability of skilled health professionals, essential medicines and medical devices and for developing an adequate recording and reporting system [103].

#### **10.2.3. Linkage with Other Sectors / Stakeholders**

In the global mission to reduce maternal mortality multiple stakeholders have been identified. If these stakeholders work together with a sense of ownership maternal health indicators can show a significant improvement both in terms of quantity and quality [104]. In Africa, partnerships between civil society groups campaigning for reproductive and human rights and health professionals have contributed towards the strengthening of health systems and thus decline in maternal deaths. This partnership has also contributed in holding health services/ governments/ policy-makers accountable for poor maternity services, and in developing user-friendly information materials for women and their families [104]. In Uganda, a multidisciplinary approach has been recommended to counter the rising maternal mortality which includes roping in students, delivering the appropriate package of information to these students through experiential opportunities in the community, and fostering networks among students to keep the issue of maternal mortality high on their personal and political agendas [105].

### **10.3. Functional Referral Services: Establishment and Maintenance**

In medicine, referral is the transfer of care for a patient from one clinician to another. It is done with an objective to transfer patient related information that facilitates appropriate response from the specialist and to minimize sufferings and mortality [106]. To counter an obstetric emergency the need to have a well established functional referral system is indispensable [106]. This service is even more important in developing nations and low-resource settings [107,108]. Maternal and neonatal deaths can be prevented if a referral system is in place to allow pregnant women to reach appropriate health services when complications are anticipated/occur [107]. The three delays model - delays in the recognition of the problem and decision to seek care, delays in reaching the appropriate facility (referral services), and delays in the care received once the woman reaches the facility - provides a conceptual framework regarding the factors that affect the timely arrival to appropriate care in obstetric emergencies [109].

### **10.4. Advocating Maternal Immunization**

To reduce maternal and infant mortality attributable to infectious diseases maternal immunization is advocated. In United States of America, maternal immunization has been recommended to prevent tetanus, influenza, hepatitis B [110]. Polysaccharide vaccines against *Haemophilus influenzae* type b, *Streptococcus pneumoniae* and *Neisseria meningitidis* has also been advocated in developed nations [110]. Maternal vaccination against influenza and pertussis is recommended in the United Kingdom [111]. In fact immunization of pregnant females during pregnancy has been advocated as an effective tool in reducing susceptibility to infection in newborn infants [111]. Practice of maternal immunization with tetanus toxoid is already widespread in 48 countries, mainly in Asia and Africa. [112]. Studies have been conducted for advocating H1N1 vaccine as well for pregnant women [113]. A systematic review has reported that the relative risk of cases of neonatal tetanus after administration of one dose of tetanus toxoid was 0.20 (95% CI 0.10 to 0.40); and the vaccine effectiveness was 80% [114].

### **10.5. Strengthening of Infrastructure & Evidence-Based Allocation of Resources**

In a matched pair cluster-randomized trial conducted in Guatemala it was revealed that in order to

decrease maternal mortality, more focus should be on indirect measures such as improving infrastructure (like functional operation theatre, availability of skilled manpower, blood storage service, facility for 24 hour delivery services including caesarean section, essential laboratory services, referral services and services for newborn care/resuscitation) and data collection systems rather than on implementing specific interventions to directly improve outcome [115]. Importance of pregnancy registration systems has also been emphasized as this will aid in strengthening of the health system, increase accountability and ultimately reduce mortality [116]. Establishment of first referral units with three critical determinants namely availability of surgical interventions, new-born care and blood storage facility on a 24 hour basis has resulted in reduction in maternal mortality [115,117]. Establishment of a maternity waiting home (provides antenatal care with skilled birth attendants and emergency obstetric care) which is within easy reach of a hospital or health centre has also been advocated in low-resource countries as a successful step in reduction of maternal mortality [117].

In general, most of the complications of pregnancy are not predictable but can be adequately managed by timely medical intervention, provided appropriate emergency care is available [118,119]. Efforts should also be taken to strengthen post-partum interventions as a means to fight maternal mortality [120]. In a study to reduce age-specific mortality in rural South Africa it has been suggested that an integrated approach is crucial to tackle highly attributable multilevel factors in preventing maternal deaths [121].

## **11. BARRIERS TO PROMOTING BETTER MATERNAL HEALTHCARE SERVICES**

To improve maternal health, barriers that limit access to quality maternal health services must be identified and addressed at all levels of the health care system. Multiple barriers such as socio-cultural factors [122], economic constraints [123], quality of health care services [124], professional relationships between midwives and physicians [122,124], and behavior of health workers [125,126], have been identified which are acting as a major obstacle in promotion of utilization of health care services. Socio-cultural and family dynamics compel some pregnant women to choose to deliver at home and to restrict them from availing emergency care services for delivery complications. From the healthcare worker perspective – fear about being insulted by physicians / necessity of

protecting their professional integrity in front of patients and relatives can lead to an over-insistence by midwives on completing deliveries at home [122]. In fact a significant amount of unmet need was revealed in a study done in sub-Saharan Africa because of no information being conveyed to the pregnant women during their antenatal period by the healthcare workers [125]. The Role of advice and counseling during antenatal sessions even though well acknowledged but is seldom given the due importance [127]. Studies have shown that a part of the non-utilization / inequalities in maternal health care is because of the inherent drawbacks in health systems, which treats clients according to their socioeconomic status [128-130]. These identified barriers can lead to non-utilization of antenatal care services by pregnant women (it includes high-risk women) and will contribute towards rise in incidence of maternal mortality.

## 12. IMPLICATIONS FOR PRACTICE

Any maternal death seriously questions the effectiveness of the healthcare delivery status of the entire nation. To plan specific strategies for ensuring maternal mortality decline, exact estimates of maternal deaths is required which can be done with the help of sisterhood method or MAPEDIR approach in developing nations. In addition, as pregnancy in adolescent girl is detrimental to health of mother as well as child, special care should be taken to discourage the same. Further for maximization of the benefits, it is necessary to increase the utilization of antenatal care services by the pregnant women. Other strategies such as promotion of institutional delivery by trained personnel, facilitation of community participation, developing collaboration with different agencies, establishment of functional referral services, and strengthening of existing infrastructure & evidence-based allocation of resources have also shown significant extent of success in different settings.

## 13. IMPLICATIONS FOR RESEARCH

It is essential to conduct community-based qualitative studies / surveys should be encouraged to recognize the perceived barriers in local settings which are impeding the utilization of antenatal and intra-natal services. Results derived from these studies will help the program managers and healthcare professionals to modify / emphasize / strengthen the existing strategies so that the ultimate challenge of maternal mortality can be effectively countered and the chances of maternal survival are improved. Simultaneously, clinical trials

should be conducted to determine the utility and safety of different newer vaccines in preventing maternal deaths.

## 14. CONCLUSION

Prioritizing among the identified challenges and barriers as already discussed is the most effective method of bringing about desired health changes. In developing nations, for delivering obstetric critical care emphasis should be on socio-cultural characteristics prevalent in the local settings such as economic constraints, identified barriers, and attitude of family members towards institutional delivery. Multiple interventions such as community participation, collaboration between different stakeholders, strengthening of referral services and infrastructure, inquiry into maternal deaths and integrated approach been advocated to effectively counter the burden of maternal mortality. A systematic approach with multi-sectoral involvement towards reduction of maternal mortality will help in the progress towards achieving the MDG – 5A.

## CONFLICT OF INTERESTS

None to be declared.

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