Journal of Comprehensive Pediatrics
www.ComprPed.com

# Millennium Development Goal Four; Child and Infant Mortality, Achievements in Economic Cooperation Organization Countries: An Ecological Study

Ali Mirzazadeh [1, 2, 3], Kourosh Holakouie Naieni [1], Arash Rashidian [4], Parviz Vazirian [5], Ghobad Moradi [1], Hossein Malekafzali [1, *]

[1] Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[2] World Health Organization, Tehran, Iran
[3] Institute for Health Policy Studies, University of California, San Francisco, USA
[4] National Institute of Health Research (NIHR), Health Management and Economics Department, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[5] 3M Health Development Institute, Tehran, Iran

*Corresponding author: Hossein Malekafzali, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, P. O. Box 14155-6446, Tehran, Iran. Tel: + 98-2188989123. Fax: + 98-2188989127, E-mail: malek179@gmail.com.

## ABSTRACT

***Background:*** It has been shown that trend of achieving to Millennium Development Goal 4 (MDG 4), varies by region and between countries, indicating the possibility of existing different barriers and/or facilitators.
***Objectives:*** This study aimed to evaluate the trend of Under Five Mortality Rate (U5MR), and Infant Mortality Rate (IMR) and explore the main challenges to reach MDG 4 by 2015.
***Patients and Methods:*** In 2009, we have reviewed the latest countries' MDG reports. The key stakeholders, from both governmental and international organizations in the country have been visited, and interviewed by the research team as a part of the data triangulation process. The last data on U5MR and IMR has been explored, and the achievements were tracked.
***Results:*** The U5MR and IMR varied from 257 and 165 deaths per 1000 live births in Afghanistan, to 24 and 17 in Turkey, respectively. Turkey has already reached the U5MR and IMR goals. Afghanistan, Uzbekistan, and Pakistan were at risk of not reaching the goals, and Iran and Tajikistan were a little beyond the time schedule. Turkmenistan, Kirghizstan and Azerbaijan were on the track on MDG on U5MR. Regarding IMR, Afghanistan, Uzbekistan, Pakistan and Iran were at the risk of not reaching the MDGs in 2015, and Turkmenistan, Kyrgyzstan and Azerbaijan were on the track. Adult literacy, Expenditure on Health and Out-of-Pocket Expenditure on Heath had a strong association with both U5MR and IMR.
***Conclusions:*** It is optimistically expected that few of ECO countries would reach the target millennium goals. More focus on the basic needs of communities through a comprehensive primary health care system, and improving health financing are experiences worked in the region, and could help the ECO countries to improve more in MDGs health related achievements.

*Keywords:* Child Mortality; Infant Mortality; Economic Cooperation Organization (ECO)

Article type: Research Article; Received: 14 Dec 2012, Revised: 24 Dec 2012, Accepted: 28 Dec 2012

Implication for health policy/practice/research/medical education:
ECO countries that are not on track to achieve millennium development goal for child and infant mortality should reconsider the community basic health needs through a comprehensive primary health care system.

Please cite this paper as:
Mirzazadeh A, Holakouie Naieni K, Rashidian A, Vazirian P, Moradi Gh, Malekafzali H. Millennium Development Goal Four; Child and Infant Mortality, Achievements in Economic Cooperation Organization Countries: An Ecological Study. J Compr Ped. 2013;4(2): 99-104. DOI: 10.17795/compreped-9925

## 1. Background

The Economic Cooperation Organization (ECO) is an intergovernmental organization based on seven Asian and three Eurasian nations. The organization's population is 416,046,863 and the area is 8,620,697 $km^2$ (1). ECO provides a platform to improve development and promote trade, and investment opportunities and recently have focused on health related development activities through technical assistance, and knowledge sharing to better track the Millennium Development Goals (MDGs) (2).

Reduce Child Mortality is the fourth goal among the list of MDGs. The recent reports from the UN (3), indicated that the number of children in developing countries who died before the age of five dropped from 100 to 72 deaths per 1000 live births between 1990 and 2008. About nine million under-five children deaths happen each year. According to the global report, the highest rates of child mortality continue to be found in sub-Saharan Africa, where, in 2008, one in seven children died before their fifth birthday. Among the 67 countries with the highest child mortality rates, only 10 are currently expected to meet the MDG target. All of these indicated that still, government need to improve the basic needs for their people to prevent such high mortality among children (4).

Globally, it has been confirmed that malnutrition, and lack of access to adequate primary healthcare, and infrastructure are the main causes of child mortality. One third of all child deaths attributed to malnutrition (2, 5).

The mortality rate and the health and nonhealth predisposing factors of infants and children have a big variety from region to region (6). Evidence-based approach needed to find the ways work to improve child health and so endure that the country is on the track of millennium development goals.

## 2. Objectives

The purpose of this study was to answer the following questions: What is the most evidence-based status of the ECO countries regarding infant and child mortality and if they are in track for achieving the goal in 2015 or not?

## 3. Patients and Methods

This review study has been performed in 2009. As the first step, a comprehensive literature review has been performed to find the most recent documents related to MDGs four indicators for each country as the member of the ECO. The focal MDG secretariats in the Ministry of Health and the International Organizations have been contacted in advance to provide the available documents and reports (mostly gray literature) for the research team.

We reviewed the latest MDGs' report, critically to extract the most valid and reliable data by the year of data collection and place of residence (if available).

In the next phase, the main stakeholders, from both governmental and international organizations, in the country have been visited and interviewed (individually and in group) by the research team. A specific data extraction toolkit was applied to extract the findings into collative tables, and list all the important pros and cons regarding the country healthcare services and public health programs.

After the literature review and the country visits, we have found that, the most valid information is gathered through the following reports:

a. Countries' cooperation based on the approved international methodologies such as the Demographic Health Surveys (DHS) and the Multiple Indicators Cluster Surveys (MICS) assessments under the supervision of the international organizations.

b. Reports published by the UNICEF, WHO, UNFPA, UNDP and other international organizations.

c. Reports prepared by the member countries based on the registered information and local censuses.

We explored the association of Out-of-Pocket Expenditure for Health, and adult literacy on U5MR and IMR and calculated R2. The multiple linear regression has been used to explore the determinant factors of U5MR and IMR, which included the Adult Literacy Rate (per 1%), Per capita total expenditure on health (per 1 USD), Out-of-Pocket Expenditure on Health (per 1%), Total expenditure on health as percentage of Gross Domestic Product (per 1%), on. STATA v.10 was applied for data analysis.

## 4. Results

Among the ECO countries, Afghanistan had the highest birth, fertility and death rates. The least fertility rate was reported in Iran and Azerbaijan with 1.7 and 1.8 TFR, respectively. Afghanistan and Pakistan with the adult literacy rates of 31% and 50% have the worst status among the ten countries. Turkey has the highest GDP, and also the lowest out-of-pocket expenditure for health. ECO countries allocated 2.4% to 7.8% of their GDP for expenditure on health (*Table 1*).

**Table 1.** Demographic and Socioeconomic StatusAmong the ECO Countries

| Country | Year | Crude Birth Rate, per 1000 people | Total Fertility Rate, Births per woman 15-49 | Crude Death Rate, per 1000 people | Adult Literacy Rate, % | Per capita Income, USD | Per capita income, PPP | Human Development Index | Percentage of government budget for health care to total government budget | Out-of-Pocket Expenditure on Health | Total expenditure on health as percentage of Gross Domestic Product |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Afghanistan** | 2007 | 48.0 | 6.3 | 17.2 | 31 | 400 | 700 | 0.352 | 4.7 | 77.9 | 5.4 |
| **Azerbaijan** | 2007 | 13.6 | 1.8 | 7.0 | 99.9 | 2550 | NA | 0.758 | 4.2 | 58.0 | 3.6 |
| **Iran** | 2007 | 17.0 | 1.7 | 6.0 | 84 | 3540 | 10840 | 0.759 | 10.3 | 41.9 | 7.8 |
| **Kazakhstan** | 2006 | 22.7 | 2.7 | 9.7 | 99.5 | 2536 | 11314 | 0.810 | 10.7 | 35.0 | 2.5 |
| **Kyrgyzstan** | 2009 | 23.1 | 2.5 | 7.0 | 98.7 | 956.4 | 1790 | 0.696 | 9.0 | 30.6 | 6.6 |
| **Pakistan** | 2007 | 25.0 | 4.1 | 7.7 | 50 | NA | 2410 | 0.539 | 5.0 | 57.9 | 2.4 |
| **Tajikistan** | 2007 | 27.2 | 3.3 | 6.9 | 99.5 | 701.9 | 2019 | 0.673 | 4.8 | 34.0 | 4.4 |
| **Turkey** | 2008 | 18.1 | 2.1 | 6.4 | 88.7 | 11054 | 13604 | 0.806 | 14.0 | 19.9 | 4.8 |
| **Turkmenistan** | 2007 | 25.1 | 3.1 | 6.1 | 98.8 | 1236 | 5860 | 0.710 | 15.0 | 31.0 | 3.9 |
| **Uzbekistan** | 2006 | 23.0 | 2.5 | 7.0 | 96.9 | NA | 2600 | 0.701 | 7.4 | 48.0 | 2.5 |

**NA: Not available**

Regarding the under-five mortality rate, Afghanistan had the worst status with 257 deaths per 1000 live births. Turkey and Iran with 24 and 33 U5MR had the best health indices. Infant mortality rate is varied from 165 (Afghanistan) to 17 (Turkey). The U5MR and IMR in 1990, and the target for MDG in 2015 have been illustrated in *Table 2*.

**Table 2.** The Situation of Infant and Child Mortality Rates (MDGs 4) in the ECO Countries

| Countries | U5MR | | | | IMR | | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | Last MDG report | 2015, Estimate | Achievements, % | 1990 | Last MDG report | 2015, Estimate | Achievements, % |
| **Afghanistan** | 260 | 257, 2007 | 87 | 33.9 | 168 | 165, 2007 | 56 | 33.9 |
| **Azerbaijan** | 98 | 39, 2007 | 33 | 84.6 | 78 | 34, 2007 | 26 | 76.5 |
| **Iran** | 54 | 33, 2007 | 18 | 54.5 | 42 | 29, 2007 | 14 | 48.3 |
| **Kazakhstan** | 87 | 36, 2006 | 29 | 80.6 | 54 | 34, 2003 | 18 | 52.9 |
| **Kyrgyzstan** | 75 | 35, 2009 | 25 | 71.4 | 63 | 28, 2009 | 21 | 75.0 |
| **Pakistan** | 132 | 90, 2007 | 44 | 48.9 | 102 | 73, 2007 | 34 | 46.6 |
| **Tajikistan** | 117 | 68, 2007 | 39 | 57.4 | 91 | 57, 2007 | 30 | 52.6 |
| **Turkey** | 82 | 24, 2008 | 27 | 112.5 | 67 | 17, 2005 | 22 | 129.4 |
| **Turkmenistan** | 93 | 50, 2007 | 31 | 62.0 | 81 | 45, 2007 | 27 | 60.0 |
| **Uzbekistan** | 73.5 | 57, 2006 | 24.5 | 43.0 | 60 | 48, 2006 | 30 | 62.5 |

To find out that whether the country is on the track, we have calculated the target in 2015 based on a reduction by two thirds, between 1990 and 2015, the mortality rate of children under five and infant. Based on the last official reports of U5MR and IMR for each country, and the year of the reports, and considering the left over years till 2015, we have calculated the achievement and categorized the ECO countries into three categories: those reached less than 50% of the target MDG, those reached 50-67% of the target MDG, and those already reached more than 67% of the target MDG. The percentage of achievement to the MDG goals, the U5MR and IMR according the last available data for each country have been reported in the Figures 1A and 1B. Turkey has already reached the U5MR and IMR MDGs. Three countries of Afghanistan, Uzbekistan and Pakistan, were at the risk of not reaching the goals, and Iran and Tajikistan were a little beyond the time schedule. Turkmenistan, Kirghizstan and Azerbaijan were on the track on MDG on U5MR (*Figure 1* A). Regarding IMR, Afghanistan, Uzbekistan, Pakistan and Iran were

at the risk of not reaching the MDGs in 2015. Kazakhstan and Tajikistan were a little bit beyond the time schedule for MDGs. Turkmenistan, Kyrgyzstan and Azerbaijan were on the track (*Figure 1* B).

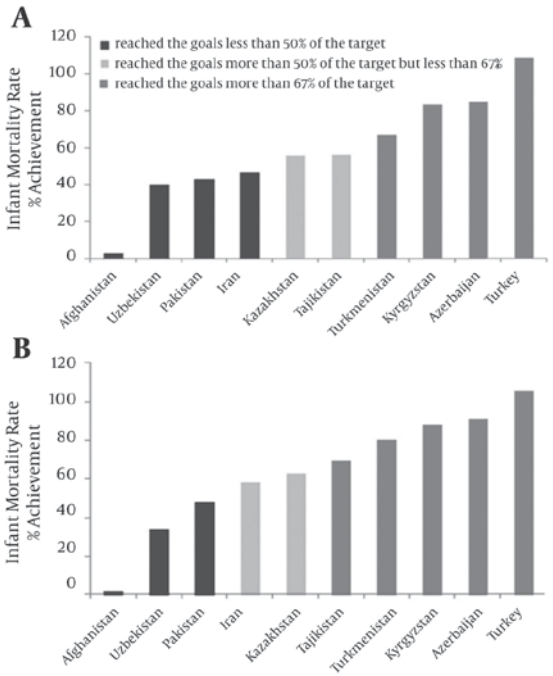


**Figure 1.** Infant and Under Five Mortality Rate - MDG Goal Achievement (Based on 2006 to 2009) in ECO Countries

As illustrated in *Figure 2*, U5MR has a logarithmic association with out-of-pocket expenditure for health ($R^2$ = 0.64), and the Adult Literacy ($R^2$ = 0.64). Similarly, there were very strong predictors for IMR ($R^2$ = 0.65-0.54).

Based on the crude regression analysis, improving the Literacy Rate and Out-of-Pocket Expenditure on Health by 10%, would decrease the U5MR by 24 and 31 cases, respectively. In the same way, a 10% improvement in the Literacy Rate and Out-of-Pocket Expenditure on Health, each would reduce the IMR by 14 and 19 cases, respectively. While in the multiple regression analysis, only improving the adult literacy (by 10%), decreases the number of U5MR and IMR by 33 and 20 cases significantly. Moreover, increasing the total expenditure on health looks to be an independent factor which decreases the number of IMR (B = -0.01, P < 0.05) (*Table 3*).

## 5. Discussion

The ECO countries vary a lot regarding the U5MR and IMR, and generally the health status. Turkey has already reached the MDGs, and has set up new goals for further improvement. This could be attributed to the recent renovation in Turkey's public health system including substantial improvements in the health system, and funding leaded to a significant decrease in the Out-of-Pocket Expenditure on Health (7). The findings indicated that improving the expenditure on health and Out-of-Pocket Expenditure on Health would have a significant

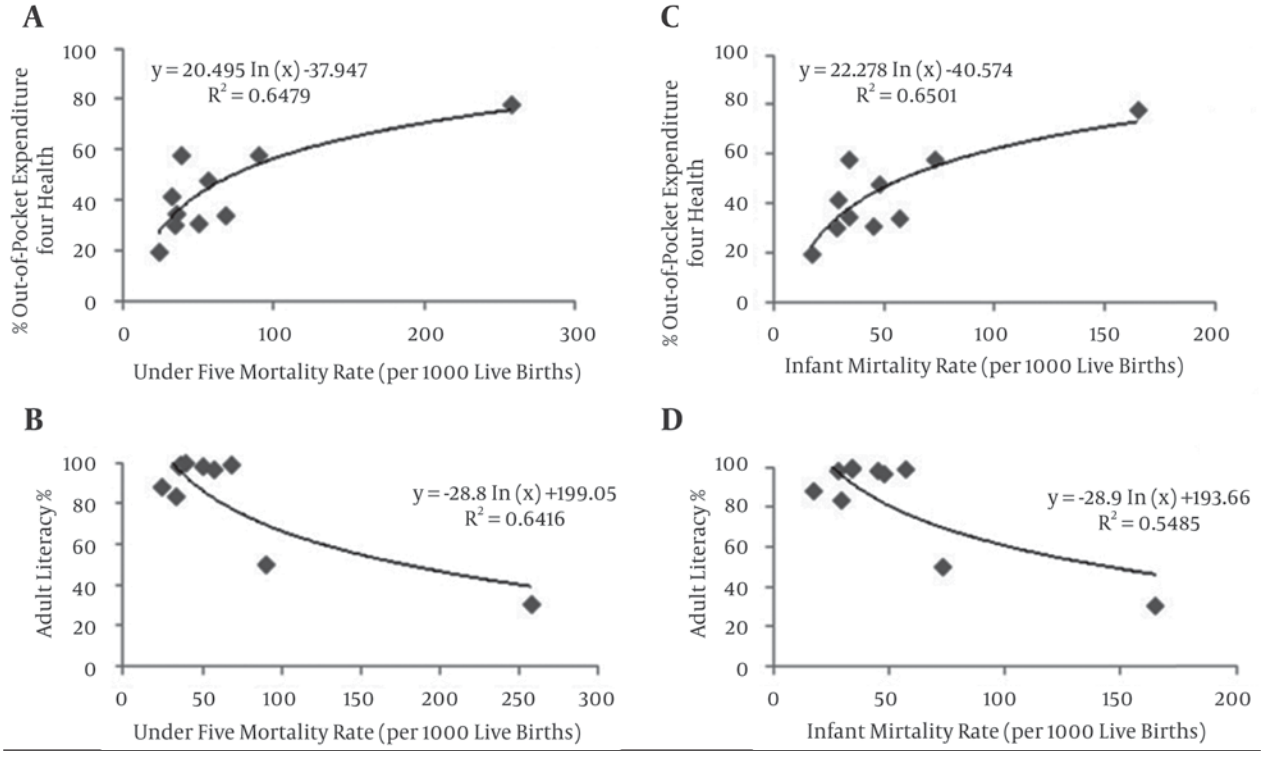


**Figure 2.** The association Between the Infant and Mortality Rate With the Out-of-Pocket Expenditure for Health and Adult Literacy in Ten ECO Countries.

**Table 3.** The Crude and Adjusted Effects of Different Socioeconomic Factors on Under Five and Infant Mortality (Per 1000 Live Births) - in Eco Countries

| Determinants | Crude Beta, SE, P | Adjusted Beta, SE, P |
|---|---|---|
| **Outcome : Under Five Mortality Rate** | | |
| **Adult Literacy Rate,per 1%** | -2.41, 0.52, 0.002[a] | -3.36, 0.52, 0.008[a] |
| **Per capita total expenditure on health, per 1 USD** | -0.01, 0.01, 0.339 | -0.01, 0.01, 0.073 |
| **Out-of-Pocket Expenditure on Health,per 1%** | 3.13, 0.87, 0.007[a] | -0.39, 0.83, 0.626 |
| **Total expenditure on health as percentage of Gross Domestic Product, per 1%** | 1.68, 13.40, 0.903 | -9.50, 4.42, 0.121 |
| **Outcome : Infant Mortality Rate** | | |
| **Adult Literacy Rate, per 1%** | -1.48, 0.32, 0.002[a] | -2.02, 0.33, 0.009[a] |
| **Per capita total expenditure on health, per 1 USD** | -0.02, 0.01, 0.262 | -0.01, 0.01, 0.048[a] |
| **Out-of-Pocket Expenditure on Health,per 1%** | 1.98, 0.52, 0.005[a] | -0.284, 0.45, 0.579 |
| **Total expenditure on health as percentage of Gross Domestic Product, per 1%** | -0.48, 8.27, 0.955 | -6.70, 2.80, 0.097 |

[a] Statistically Significant ($P < 0.05$)

effect on reducing the U5MR and IMR. This has been also reported in 2009 by Ansah *et al* (8). The mechanism of funding for health is also an important issue. Iran is paying 7.8% of the GDP for health, which is the highest among the ECO countries, but still has the Out-of-Pocket Expenditure on Health at the level of 42%. While Kazakhstan, Tajikistan, Turkey, and Turkmenistan spend less percentage of GDP for health, but community does not need to pay more than 35% of health expenditure out of their pocket. The effective funding mechanism would prominently improve the universal access to the basic needs in the community and does not mean to increase resources for health, but have the focus on efficient use of availed resources which is the priority for all the countries in the region which experiencing lots of constrains. In some ECO countries like Afghanistan and Pakistan, the lack of primary healthcare (PHC) is one of the main structural barriers to provide basic health needs to mothers, and also infants and children. In the medical literature, there are strong evidences regarding the effectiveness of PHC to reduce the child mortality (5, 9). In other ECO countries, especially those became independent from the Soviet Unions, with a brilliant experience on the PHC development, there is an urgent need to re-establish the PHC system to be fitted to the current public health problems, while always basic needs remain the core function of the PHC in the highest quality level. It is highly recommended that the ECO secretariat help and support the member countries to re-establish and improve the PHC, to integrate the prenatal and neonate health programs. Based on the findings, adult literacy was a strong independent determinant factor for the U5MR and IMR. The education and literacy itself is a separated goal in the MDG (Goal 2), which highlights its importance. Governments have to expand the training/educational programs to improve the national literacy level. However, it should be always considered that these public educational packages address the health literacy of the communities. In the ECO countries, we can see different patterns of association between the Literacy and U5MR and IMR. Countries like Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, have the adult literacy level of about 99%, while their IMR is ranged between 28 to 57, and U5MR varied between 35 and 68. Iran and Turkey have the literacy levels of 84% and 88%, holding the IMR of 29 and 17, respectively, and U5MR of 33 and 24. And the third group among the ECO countries includes Afghanistan and Pakistan with the literacy levels of 31% and 50%, having the IMR of 165 and 73, and U5MR of 257 and 90, respectively. This reminds the governments that improving the adult literacy level would improve the child health indices, both if the literacy expanded enough to all subnational regions and community subgroups, and also is deep enough to improve the health literacy (6, 10). The other important areas that needs special consideration from the government, is improving the surveillance system to have all the components including routine reporting system, registries, and household surveys. During the literature review, we have tried a lot to find the latest and the most accurate statistics on the IMR and U5MR. In some ECO countries such surveillance has been in placed but data was not available at the decision-making departments, and there was a gap in usage of the data for evidence-base decision making. MICS and DHS were the main sources of data for many countries. We could not find specific plan to continue for the next rounds of these national surveys to monitor the U5MR and IMR in the ECO countries, which is so needed to ensure reaching the MDGs by 2015. Our specific suggestion on this is to design and implement a two continues rounds of national MICS or DHS survey in each ECO country in 2012 and 2014 to better monitor the achievements. In some visited countries, abortion is generally behaved as a Reproductive Health (including Family Planning) strategy; while according to the definition of UNFPA, abortion shall not be applied as an alternative method of family planning health in any cases, and it has serious complications, mortality and morbidity,

for both mother and child. Providing a better access to safe family planning health devices, and strategies as well as training programs for the health providers could improve the situation, and ECO secretariat could act a lot on these activities. It is much needed from the ECO secretariat to support the member countries to develop and expand the coverage of the child, and mother friendly hospitals in the ECO countries.

## Acknowledgements

We want to thank all experts in the Ministry of Health, and the UN agencies in all ECO countries, who have contributed in our discussion meetings, and helped a lot for data acquisition, updating and triangulation process.

## Authors' Contribution

None declared.

## Financial Disclosure

None declared.

## Funding/Support

This project was funded by the UNICEF and ECO secretariat

## References

1. ECO S. Statistics. 2011; Available from: http://www.ecosecretariat.org/Statistics/Stat_02_01.htm.
2. Bhutta ZA, Chopra M, Axelson H, Berman P, Boerma T, Bryce J. Countdown to 2015 decade report (2000-10): taking stock of maternal, newborn, and child survival. *Lancet*.2010;**375**(9730):2032-44
3. Fund UCs. The Millennium Development Goals Report 2010, United Nations. 2010; Available from: www.unicef.org
4. United Nations . The latest estimates finalized in August by the United Nations Inter-agency Group for Child Mortality Estimation. IGME; 2010; Available from: http://www.childinfo.org/files/Child_Mortality_Report_2010.pdf.
5. Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L. Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries. *Lancet*.2008;**375**(9730)
6. Black RE, Cousens S, Johnson HL, Lawn JE, Rudan I, Bassani DG. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet*.2010;**375**(9730):1969-87
7. Akbulut Y, Sarp N, Ugurluoglu E. Reform of the health care system in Turkey: a review of universal health insurance. *World Hosp Health Serv*.2007;**43**(1):13-6
8. Ansah EK, Narh-Bana S, Asiamah S, Dzordzordzi V, Biantey K, Dickson K, et al. Effect of removing direct payment for health care on utilisation and health outcomes in Ghanaian children: a randomised controlled trial. *PLoS Med*.2009;**6**(1):7-11
9. Singh A, Pathak PK, Chauhan RK, Pan W. Infant and child mortality in India in the last two decades: a geospatial analysis. *PLoS One*.2011;**6**(11):2685-6
10. Chatterjee A, Paily VP. Achieving Millennium Development Goals 4 and 5 in India. *BJOG*.2011;**118 Suppl 2**:47-59