

## Development of Iranian Health R and D Performance Assessment Indicators

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**Abstract:** Iran's contribution to global scientific output was 29% in 2003 but the country has appointed in vision document (Iran 1404) to obtain first position of science, research and technology in her area in 2025. Therefore, Iran must assess her capacity of conducting high quality research and strength it regularly. Developing right indicators for health research performance assessment was the main purpose of this study. It had a complementary purpose of identifying the main problems of health research in Iran. This study was conducted in 3 phases including environmental scan, consultation and interviewing and consensus-building. First 2 phases led to a draft of potential indicators. We used modified Delphi technique for consensus-building in phase 3. After 3 rounds, 18 indicators obtained consensus, some of them have comparison base and some another relate to country's priorities. Also, we identified 8 main problems of Iranian health research system based on the viewpoints of the health professionals. The selected 18 indicators provide a useful instrument for assessing country's health research capacity. Also, decision makers can formulate suitable policies for health research with addressing main problems identified in this study.

**Key words:** Health, research and development, performance assessment, indicator, Iran

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### INTRODUCTION

The knowledge economy is the objective that many countries around the world are targeting in their strategic planning, it is meant to enable social and economical development. Research is the key to creating knowledge economy (Nason, 2008). Health research has been defined by the Global Forum as a process to obtaining systematic knowledge and technology that can be used to improve the health of individuals or groups or to reduce in health inequalities (Scoggins, 2008). It spans a broad spectrum of research from basic/fundamental research to very applied clinical research (Cooksey, 2006). Also, WHO defines research in three broad categories, fundamental, strategic and development and intervention, each with a different balance between advancement of knowledge and application and encompasses, in variety degrees, the full spectrum of health and medical research (Scoggins, 2008). The main goals of health research is the advancement of scientific knowledge and utilization of knowledge to improve health and health equity. There are also many intermediary benefits, such as benefits to future researchers, political and administrative benefits, other benefits to the health sector, as well as other social and economic gains (Sadana and Pang, 2004). Health research is essential for the preparation and implementation of

national health policies, for planning health actions and for effective delivery of health services. Health research is conducted for the benefit of patients, users, care professionals and the public in general (Vianna *et al.*, 2007). According to these importance, each year >US \$100 billion is spent on health R and D in the world by the public and private sectors but despite this investment, deficiencies in the process of establishing and supporting a set of priorities for health R and D have led to a situation in which <10% of the public and private financial resources destined for research are devoted to the health problems of 90% of the world population, an imbalance known as the 10/90 gap (Vianna *et al.*, 2007). This study had the general purpose of developing a set of indicators for assessing the performance of Iranian health research system. It also, had complementary purpose of identifying the main problems and barriers of Iranian health research. So, we look the situation of health research and development in some countries briefly:

**USA:** The United States is arguably the world's best in terms of understanding health, the public health infrastructure and the research that drives innovation (Wooley *et al.*, 2005). It is the world leader in health research in terms of total investment, as well as investment in proportion to overall health spending and

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holds a premier position in funding and conducting health R and D (Shergold, 2008). Total R and D expenditure in US was \$342.9 billion in 2006, from which \$101.1 billion allocated to health R and D. So health R and D expenditures as a share of total R and D expenditures was 29/5%. This share has increased in following years (Payson, 2008). Total health R and D expenditure in fiscal year 2009 budget of department of health and human services reached to \$29946 million that has increased by 5% from 2008 (OBM, 2008). Also, U.S invests much amount in global health research. This amount was approximately \$9.5 billion in 2003 that was about one-tenth of the annual investment in health research in this country. However, the majority of Americans (71%) believe that the United States is spending too little on research designed to improve health around the world (Wooley *et al.*, 2005).

Funding for biomedical researches in U.S originates from various public and private sources. Public funding, which is ultimately provided by taxpayers can be divided into federal and state funds. Private funding is provided by individuals, either as legacies, donations to non-for profit organizations, or investment in commercial companies. Furthermore, US research institutions attract gifted investigators from around the world (Shergold, 2008). Therefore, the main funders of health R and D in the United States are private for profit sector, national institute of health, other federal government excluding NIH, state and local government and academic and non for profit institutions (Payson, 2008). Industry and NIH are key players provide over 80% of all support of health research in the country. In US federal investment in health-related research is determined by the priorities of the federal R and D strategy, as well as the budget (Shergol, 2008). In term of performing, the main performers are industry, federal government, universities and colleges and other non profit institutions but most R and D performs by industry (Payson, 2008). Despite US investment and achievements in health research field, funding shortages, ethical restrictions and immigration hurdles threaten the United State's traditional ability to attract, develop and retain world class research capacity (Shergold, 2008).

**Canada:** Canada's culture of science and technology is very strong (Barber and Crelinsten, 2005). Canada has many of the right ingredients to succeed in the knowledge based economy. Over the past decade, it has made significant gains in building world class research facilities, (Anonymous, 2008) and the government of Canada has demonstrated its commitment to health research through a series of significant investments (Birdsell and Asselberg, 2006). In terms of supply scientists, the health

professional and biological scientist produced 14% of all degrees in Canada in 2000 (Nason, 2008). Also, looking at R and D personnel as a share of employment, Canada is about average at a little over 1% but behind leading countries in R and D such as Sweden. Canada's R and D spending is currently stuck in the mid-range of the world industrialized nations (Harris, 2005). Funding for health R and D in Canada has increased significantly in recent years in both total dollars and in relation to Gross Domestic Product (GDP) (Birdsell and Asselberg, 2006). Gross Domestic Expenditures on R and D (GERD) in the health field compared to total GERD was 21% in 2003 that increased to 21.85 in 2007. On a per capita health R and D spending increased from \$163 in 2003 to an estimated \$192 in 2007. The main funders of health R&D in Canada were higher education, business enterprise, federal government, private nonprofit and provincial governments from 2003-2007 (Nason, 2008). Canadians are major contributor to health R and D funding in Canada but also foreign investments in health R and D performed in Canada increased 20-fold in last 25 years (Birdsell and Asselberg, 2006). Peer review is the accepted method for funding allocation and funding for health research traditionally comes as activity or person funding (Nason, 2008). Also, the main performers of health R and D were higher education, business enterprise, federal government, foreign, private non-for profit and provincial governments from 2003-2007. Setting research priorities within a system is often a matter of including the views of relevant stakeholders. At the highest level, in Canada, the public health agency of Canada monitors the public health problems (Nason, 2008). Investments in health R and D have led to better health care in Canada (Birdsell and Asselberg, 2006). But as with all countries, Canada has a specific set of health research problems and issues such as patient wait times, IT and medical records, physicians supply, public-private partnership and stem cell research that is currently seeking to address (Nason, 2008).

**Developing countries:** According to a 1990 report of the international commission on health research for development, strengthening research capacity in developing countries is one of the most powerful, cost effective and sustainable means of advancing health and development. However, in developing countries one often hears that the health sector can not develop research due to lack of managerial support, time and funding. If we look carefully, we may also find little or no reference to research in mission statements (White, 2002). Today, over 95% of world wide R and D activities occur in developed countries (Dentico, 2005). Despite, global spending on health R and D more than tripled between 1990 and 2001

but most of it was spent by high income countries in high income countries (Stephen, 2005). According to the UNESCO (2000), the share of developed and developing countries from world held research expenditure 1999-2000 was 79 and 21%, respectively. Country-specific data indicate that some but not all developing countries already invest more substantially in health research. However most of money is used to maintain the (inadequate) research infrastructure and to pay researchers salaries (CHRED, 2004). Also, evidence suggests that current research carried out in these countries responds not to national needs and that is not responsive to future health needs (Farley, 2005). Therefore, it seems that governments of developing countries must address the crisis in health R and D.

**The case of Iran:** Health statistics demonstrate remarkable progress in the field of primary health care and academic education in Iran within recent decades. Iran has also had obvious progress in the field of research (Larijani and Zahedi, 2006). Before 1996 research expenditures in the Iranian national budget were stipulated as research and investigation and were dispersed among the allocated funds and other resources available to the ministries, organizations and foundations. This dispersion, which somehow hampered a clear estimation of R and D for medicine and other academic sectors was overcome in the 1996 national budget by incorporating a new clear item, the so called research chapter. In 1996, 0.47% of national budget was allocated to R and D these figures was 0.59 and 0.42% in the following 2 years. Now, Iran with about 0.4% of her GDP allocated to R and D ranks for behind industrialized societies and even the world average of 1.4%, though still in the acceptable limits among the third world standards. Two decades ago this figure was <0.1%, thus the fourfold increase seems promising. In Iran, same other developing countries the major source of funding for R and D comes from governmental sector and the share of private sector negligible. The amount of governmental sector in Iran sums to >99%. An estimate of GERD as a percentage of GDP in mid 90s in some countries including Iran shows that Iran (0.4%) ranks much lower than Japan (2.3%), North America (2.5%) and western Europe (1.8%), lagging even behind the world average (1.4%) but not much lower than India (0.6%) and China (0.5%).

Approximately, a fifth R and D resources allocated to the academic sector in Iran. Over the past decade, as low as the 0.020% of national budget in 1997 to 0.027% in 1998 been provided for R and D in medicine which is only about 5% of the annual investments in R and D (Malekzadeh *et al.*, 2001). The number of academic students has also increased to >10 times in the past 20 years (Larijani and Zahedi, 2006), from which 15.7% are

medical and health sciences students (Malekzadeh *et al.*, 2001). Women comprised about 54% of the students in the health and medical fields. The number of faculty members in all fields including medicine was 8249 in 1978, which rose to 25391 in 1998. According to 1999 statistics, 9783 faculty members were employed in the health and medical branches of governmental and nongovernmental universities of Iran. Iran's academic infrastructure has expanded during the recent decade. The number of medical, pharmacy and dentistry schools was 10 in 1970 that rose to 55 in 1996. Also, before 1978, Iran had <7 research centers; nowadays this figure has passed 26. In term of research personnel, lack of reliable definition impedes us from providing meaningful figures. In one official communication, the Iranian ministry of health and medical education claimed that 10122 research staffs are present in different sectors of medicine in the year 2000.

This report does not offer the criteria for research staff; hence the figure should be evaluated cautiously. (Malekzadeh *et al.*, 2001). In 2003, Iranian scientists published 3277 papers in the international journals, an amazing 30-fold increase over 1985 (Larijani and Zahedi, 2006) but Iran had only 200 articles were cited in the year 2000 in Medline. This figure was 12 in 1980. Although, the trend is promising for Iran, it tags, however far behind her neighbors. Egypt and Saudi Arabia have far more articles cited in Medline. Even smaller countries such as Kuwait are doing better (Malekzadeh *et al.*, 2001). Iran's contribution to global scientific output rose from 0.0003% in 1970 to 0.29% in 2003, which much of the growth occurring since the early 1990s (Larijani and Zahedi, 2006). Now, Iran with her all achievements and deficiencies, has a clear vision for the future. Iranian vision document (Iran 1404) appointed that Iran must have first position in her area in sciences, research and technology after 20 years (Tarighatmonfared *et al.*, 2008). Moving from current standing to first position by the end of this period (2025) needs to reliable assessing of the progresses in all fields including health research. But what are the right indicators to assess our health research performance? The right indicators must show the progresses according to national priorities and also must enable us to compare the situation with other countries specially our neighbors. Developing same set of indicators was the main objective of this study.

## MATERIALS AND METHODS

**Environmental scan:** In the first phase of study, health system and health research system performance assessment initiatives in other countries, as well as transnational frameworks and national documents were reviewed in order to develop preliminary list of indicators.

**Table 1: Demographic characteristics of the Delphi participants**

Profession/Gender	Physician (%)	Nurse (%)	Health manager (%)	Researcher (%)	Decision-maker (%)	Total (%)
Male	14 (37)	2 (5)	6 (16)	6 (16)	10 (26)	38 (100)
Female	3 (23)	2 (15)	5 (39)	1 (8)	2 (15)	13 (100)

**Web-based consultation and face-to-face interviewing:**

We designed an indicator proposal form and mailed it for 38 health professionals across the country, from which 26 professionals replied the mail. In each mail, after a brief description of the study, receivers asked to propose indicator(s) for health research system performance assessment. Also, 27 interviewing were conducted other health professionals from ministry of health and medical education, members of parliament health commission, Iranian late planning organization (now called planning deputy of president) and some universities of medical sciences. Interviewees were selected purposive by using opportunistic sampling method. In each interview that is conducted in depth in average 40-50 min, we obtain the viewpoints of Iranian health professionals about main problems and barriers of health research and the indicators they proposed for assessing health research performance in the country. In the end of this phase, we prepared a draft of indicators. This draft was used as consensus building instrument.

**Consensus building:** We used the modified Delphi technique for consensus building. All 27 interviewees identified in interviewing phase and 26 that we received their mails in the phase 2, participated in Delphi process. The main characteristics of them are outlined in Table 1. In this study, the survey was distributed via e-mail and the participants never had opportunity to meet in person regarding the consensus process free of strong personality coercion. Three rounds of Delphi were conducted. In each round participants asked should this indicator be included in Iranian health research performance assessment indicators? Participants ranked each indicator on a 5 point Likert scale, where

- Strongly disagree
- Disagree
- Not sure
- Agree
- Strongly agree

In round one, professionals could suggest additional indicators that then added for the next rounds. In each round, the mean score of each indicator and it's standard deviation was calculated. In rounds 2 and 3, surveys were individually tailored, so each participant received her/his score for each indicator and the mean score of the group on the previous round. The cut off, of all rounds were >4.0

(agree or strongly agree) for achieving consensus approval. The cut off, for achieving consensus dropped for round one was <2.0, for round 2 was ≤3.5 and for round 3 was ≤4. In each round, indicators which not acquired consensus score (approval or drop) and also indicators that which acquired consensus score (approval or drop) but with standard deviation >1.5 (agreed deviation for study) that named non absolute consensus went to next round.

**RESULTS**

From the study (environmental scan and consultation and interviewing), we prepared a draft of 39 preliminary indicators. These indicators were ranked in the first round of Delphi. After collection and analyzing the responses 10 indicators were approved and 12 indicators were dropped with absolute consensus. Remaining 17 indicators and 4 ones suggested in round one were ranked in second round. In this round 6 indicators were approved and 10 indicators were dropped absolutely. In round 3, 5 indicators were presented, from which 2 were approved to be in Iranian health research performance assessment indicator set. Therefore, in total 18 indicators were approved in Delphi process. Table 2 shows the detail of each Delphi process result and Table 3 shows final selected indicators:

This study had a complementary objective of identifying the main problems of Iranian health R and D. Based on the view point of health professionals participated in this study, various problems suffer Iranian health R and D. The main of these problems, at which we believe are same as other developing countries include:

- Low investment on health research (low ratio of GERD to GDP)
- The assignment or promote of people to research posts for which they are not (or inadequately) qualified
- Lack of high commitment and poor culture of research
- Deficiencies in research priority setting, which results in conducting not useful researches or duplication of other works
- The high rate of brain drain to developed countries due to lack of suitable job conditions for them
- Lack of private sector contribution (or very poor contribution) in health research

Table 2: Delphi process results

Delphi round	No. achieving approval consensus (A*)	No. achieving approval consensus (NA**)	No. not achieving consensus	No. achieving dropping consensus (NA)	No. achieving dropping consensus (A)	No. suggested indicators
1	10	2	15	0	12	4
2	6	-	5	-	10	-
3	2	-	-	-	3	-

\*A = Absolute, \*\*NA = Non Absolute

Table 3: Selected indicators for Iranian health research performance assessment

Indicators	Definition	Report period
Total health R and D expenditures	Total amount of health R and D expenditures	Annual
The ratio of health R and D expenditures to total GERD	Health R and D expenditures/GERD	Annual
Total health R and D expenditures as a share of worldwide health R and D expenditures	Total Iranian health R and D expenditures/total worldwide health R and D expenditures	Annual
The ratio of health R and D expenditure to total health expenditure	Total health R and D expenditures/total health expenditures	Annual
Per capita health R and D expenditure	Total health R and D expenditures/population	Annual
Private health research expenditure as a percentage of total health research expenditure	Private health research expenditures×100/total health research expenditures	Annual
Pharmaceutical industry investment in R and D (both in dollars and as percentage of industry sales)	1) total pharmaceutical industry investment in R and D 2) 1×100/industry sales	Annual
The ratio of new drugs introduced across country to worldwide new emerged drugs	Number of new drugs produced in Iran/number of all new drugs emerged world wide	5 years
Per capita qualified researcher	Total qualified researchers/population	Annual
Growth percentage of published papers	Differences between number of published papers in the year and previous year/number of published papers in previous year	Annual
Existing of clear program for research in public health field	Descriptive-describe existing programs and their applications.	Annual
Investments on the analytical tools needed for supporting from research functions	Total investment (in dollar) on analytical tools	Annual
Existing of suitable communication means for subscribing of research findings across country and whit another countries	Descriptive-describe communication means (or processes) exist for subscription of research findings.	Annual
Timely, relevant and evidence-based research about population health status	Number of funded projects/researches	Annual
Timely, relevant and evidence-based research about primary care	Number of funded projects/researches	Annual
Timely, relevant and evidence-based research about aging care	Number of funded projects/researches	Annual
Timely, relevant and evidence-based research about hospital sector policy-making	Number of funded projects/researches	Annual
Timely, relevant and evidence-based research about privatization policy-making	Number of funded projects/researches	Annual

- Weak linkage of universities and research centers with industry
- Difficulties of accessing to modern equipments

### DISCUSSION

Research had played a central part in improving health and health care over the centuries (CHRED, 1990). Challenges to health in developing countries are many. Those for which research can produce solutions are equally many (Ijsselmuiden, 2009). Although, research in developing countries has already contributed significantly to advances but a lack of resources in these countries can limit their options (Ridley and Mocumbi, 2009). In developing countries, Iran has her vision to obtain first position in the area. Now, timely and essential for Iran to develop good policies and increase her ability to conduct high quality researches. In this way, assessing progresses and comparing it with other countries based on the right indicators is inevitable.

### CONCLUSION

This study developed a set of 18 indicators and identified main barriers of Iranian health research. Although, it conducted in Iran, but we believe that other developing countries have same problems in their health research system and can use same indicators for assessing their research capacity in health field.

In the next step Iranian ministry of health must expand, it's ability of data collection and applies these consensus-based indicators for analyzing the research situation that will help us to formulate suitable policies for overcoming weaknesses and improving strengths in the health research.

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