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Profile of Productivity and Equity in Health Resource Generation: Policy Implications of Iran's Health Transformation Plan

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ABSTRACT

Resource generation in health system provides mechanisms for training efficient and effective workforce and supplies facilities and equipment for delivering health services. Iran's Health Transformation Plan is one of the major reforms implemented in 2014 designed to realize the scientific authority of the country among the countries in the region in horizon 2025 (Solar Year 1404). Therefore, the state of function of resource generation in the areas of education, research, and infrastructure suitable for provision of health services may provide valuable policy implications for informed decision-making. Therefore, the status of resource generation in the areas of education, research and infrastructure (focusing on human resources and medicine as two expensive and effective drivers) from the lens of productivity and equity can provide invaluable policy implications for informed decision-making. The function of resource generation in the three areas of education, research, and infrastructures of human resources and medicine in health system encounters many challenges in terms of productivity and equity. In this perspective paper, besides assessing these challenges in the light of available research evidence, it has been tried to identify these and aimed to suggest several policy recommendations in these areas for improving evidence-based policymaking.

Key words: Productivity, Resource generation, Equity, Health policy

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Introduction

In recent decades, considerable improvements and successes have been made in improving the performance indices of the health system in countries all over the world. In spite of these successes, goals related to productivity and equity remain controversial and challenging issues central to global health discourses and the key concern of health policy makers worldwide, particularly in developing countries (1, 2). Depending on the problem and its related structure, these concepts can be interrelated or separate from one another, so that enhanced productivity do not always in line with increased equity, and vice versa (3). In this regard, inadequate investment, corruption, poor management, lack of sufficient and sustainable financial resources are the key issues facing health systems and lead to many problems like low productivity and inequality in healthcare access (4). Nevertheless, evidence reveals that attention to productivity, optimal use of resources, as well as equitable distribution play a decisive role in achieving universal health coverage (5, 6). To this end, considering the function of resource generation through training efficient, skilled, and effective human resources and providing facilities, equipment, and requirements needed to provide health services may serve as a knob in provision of equitable and high-quality health services and ultimately provision and promotion of society's health (2, 7). Function of resource generation refers to the generation of health system inputs, in particular human resources, knowledge, and physical resources (2, 8).

Training the skilled and efficient workforce in the health system is a function of education and research in the scope of higher education in medical sciences. In this regard, educational and research activities in the field of health sciences' higher education are directly and indirectly related to society's health. Assessment of indicators relevant to the quality and quantity of trained human resources as well as the functions of education and research in the scope of medical sciences' higher education and their distribution in a geographical area may help assess educational and research policies from different perspectives of productivity and equity. Hence, there is a special emphasis on the Iran's comprehensive health science roadmap and the health transformation plan (HTP) in medical education sector to expand the equity-oriented approach and increase productivity (9). Recognizing the resource generation function requires continuous measurement and monitoring of data including quantity and quality indicators of students/graduates in health education institutions that may also help predict health human resource supply (8). shortcomings like the lack of a clear framework for valid, reliable, relevant, and comprehensive human resource indicators, the state of scientific production, productivity, and equity in human resources, besides health education and research sector indicators have made health policy makers face with bottlenecks in making decisions on each of these cases in Iran. Hence, descriptive surveys from both perspectives of productivity and equity in the medical education system, employed health human resources and expensive consumables (like medicine) for policymakers are of great importance to understand the current state of resource generation and consequently they would be used in evidence-informed decision-making. Therefore, this perspective paper tries to investigate the available case studies of the state of higher education in the scopes of research and education and the two costly and effective health system infrastructures (human resources and medicine) in terms of productivity and equity. Also, we suggest policy implications related to these scopes for using in evidence-based policymaking.

Productivity and Equity in Education Function

Promotion of productivity and equity in training of expertise, efficient and entrepreneurship health human resource is one of the key criteria of the higher education system, so that in Iran, under the title of the development and innovation of medical science education packages, these two axes have been emphasized in general policies and orientations with the development of the HTP in the medical education sector.

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The results of assessment of efficiency and productivity in the scope of education focusing on quantitative indices of student education suggest that the average educational efficiency and utilization of medical sciences universities in the three periods of 2010, 2013, and 2016 is optimal and the educational productivity of universities has averagely grown by 5 %. This growth in the years before the HTP is approximately 1 % and in the years after applying the plan, it is 10 %. In other words, in the years after the implementation of the HTP, the efficiency of medical universities in the scope of education has been optimal and acceptable, and productivity in this area has positively increased (10).

Distribution of education sector indices among universities and schools of medical sciences reveals that the Gini coefficient of distribution of indices of the number of male and female students and faculty members has been somehow decreasing; however, with a moderate level of inequality; while inequality in the numbers of non-faculty staffs and educational budget have slightly increased. In terms of disciplines by degrees, discontinued BA had the least inequality and highest homogeneity among medical universities, and fellowship had the highest inequality and least homogeneity among medical universities. Partly these inequalities are vindicated given the different mission of medical universities and their typing and polarization in the scope of educational activities and the service delivery. Contributing of factors in these inequalities is not possible to be measured using the Gini coefficient and it requires more detailed data collection besides using more diverse indices to measure inequality and determine its effective factors (11).

Productivity and Equity in Research Function

In Iran, the empowerment and capacity of universities is one of the pillars of development of higher education system in the field of medical sciences to develop interdisciplinary and multidisciplinary knowledge through development of research-based, knowledge-based, and entrepreneurial activities. Moreover, development of the scientific position in the region emphasized in the Comprehensive Scientific Plan of the country and outlook 2025 (Solar Year 1404), requires the development of research capacity building and reinforcement of Iran's scientific status among the countries of the region through scientific diffusion coefficient besides scientific indices.

Results of efficiency and productivity assessment in this field through focusing on quantitative input and output indices including total number of faculty members, total number of students of each university, number of higher education students, number of full professors and associate professors, total number of papers, number of international papers, number of citations, h-index, as well as self-citation percentage indicate that the average scores of universities' technical efficiency over the three periods of 2010, 2013, and 2016 are lower than educational productivity. Based on the Malmquist Productivity Index, there has been a 6 % growth in productivity during 2010 to 2013, but from 2013 to 2016, university performance has been associated with a 12 % decline in productivity mainly in the years after the HTP. The average total productivity shows a 4 % decline in productivity growth. Among productivity components, technological efficiency decrease by 8 % and other components showing growth. Some universities seem to act ineffectively in the scope of research and their average productivity growth has been declining, mainly due to decreased technology efficiency growth. Given the rapid development of technology in recent years, it may be the result of lack of effective using of new technologies. In recent years, due to various motives, written scientific productions like academic papers, especially in medical universities, has been increasing. In fact, through using existing inputs, more outputs have been achieved and so, technical efficiency has improved. Nevertheless, despite this efficiency improvement, the productivity growth has been reduced. More precise examination of the reason of productivity decline in this area may determine the cause of this problem, for instance, through doing studies using qualitative indicators to specify the output quality of research productions (12).

In the section of the research indicators distribution across medical universities, the results

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revealed that in recent years, the Gini coefficients of Scimago, SNIP, impact factor, international papers, total number of papers, and total number of citations had high inequality. Of course, compared to the years before the HTP, the trend of these inequalities in the years following the HTP shows a slight decrease. Gini coefficients of academic self-citation index, citation per paper, and h-index have had low to relatively modest inequality, and the trend of inequality for these indices except for citation per paper has declined over the years of HTP compared to years before it and homogeneity between universities has increased. The indices of faculty member per students and budget per papers also have relatively moderate inequalities, but these inequalities have slightly declined in the years after implementation of the HTP (13).

Another key factor in research activities of universities is the quantitative and qualitative growth trend of scientific productions of prioritized health disciplines according to Iran's comprehensive health science roadmap for the realization of goals of horizon 2025. The results suggest that based on scientific metrics, from 2010 to 2017, the highest h-index was belonging to the nanotechnology in the perfection category, the infectious disease in the survival category, and ecological system in the infrastructure category. The highest citation rank is traditional medicine in perfection category with the rank of 8, in infrastructure category, family physician with the rank of 9, and in the survival category, dentistry with the rank of 15. In the infrastructure category, public health with 7045 papers, in the perfection category, biotechnology with 5371 papers, and in the survival category infectious diseases with 5135 papers have had the most productions. The highest h-index and scientific productions averages are in the category of perfection, survival, and infrastructure, respectively. In all subject areas, there has been significant growth in quality and quantity; however, there is a gap with favorable status. Furthermore, it may be concluded that, if sustained, Iran's rank and position in the next years could be expected to jump further in terms of quality and quantity, since based on data from Scimago, the ranks of medical sciences have totally increased by five rank compared to before the implementation of the Iran's comprehensive health science roadmap. It can also be concluded that the fields with vision have been able to grow significantly more than other subject areas (14).

The main vision of transformation in the medical sciences higher education system in the Iran is the achievement of scientific authority in the region, which in addition to focusing on the development of empowerments and capacity building for research and education apt to Iran's comprehensive science roadmap, requires deep understanding of the position of universities in socio-economic development through examining the transition trend of Iranian medical sciences universities across academic generations in the world. So that as the globalization phenomenon develops, the role and position of universities in promoting the socio-economic status of societies will be an indispensable necessity. In this regard, universities should quickly move from the first generation, i.e. education-oriented universities, to research-based universities and then join wealth-generating focusing on innovative and entrepreneurial approaches and welfare-developing universities in future generations. The results of documents reviews show that the position and entity of universities in Iran is transiting from the first and second generations of university (education- and research-oriented universities) to the third generation (wealth-generation) and is significantly distant from its role in the fourth generation of universities. The high focus on the quantitative growth of indicators like number of training specialized human resources and increasing the number of papers and citations has resulted in a halt in the litany and structural layers of the causal layered analysis framework and has challenged the sustainability of the current trend in scientific development. Given the upstream documents for the acquisition of scientific authority as well as the development of technology, the fundamental transformation of science in the deep layers such as worldview, middle-value and scientific structures is essential within the framework of Islamic Republic discourse (15).

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Another research development indicator is considering the research authenticity index and reinforcing adherence to values and ethics in the process of conducting research and disseminating the results. Adherence to these values may contribute to the comprehensive development of ethical virtues and the efficient, optimal, and effective use of research achievements in development of societies and thus maximize the benefits of the position of research and minimize immoralities. Hence, paying attention to the key unpleasant themes and phenomena such as plagiarism and research infringement, research misconduct, as well as promoting appropriate mechanisms to prevent the occurrence of such unethical practices is part of the mission of universities and higher education centers. The results of studies in the European Union member countries on preventive policies for plagiarism indicate that national-level interventions have been performed in eight areas including 1) national consensus and agreement on cases of plagiarism and misconduct, 2) policy formulation, 3) monitoring and supervision, 4) development of financial supports, 5) development of software and databases, 6) development of training programs for faculty members and students, 7) dissemination and utilization of successful experiences, and finally, 8) enacting laws related to plagiarism and punishment. Thus, it is essential to pay attention to the appropriateness of preventive policies and regulations, early detection and dealing with plagiarism cases in consistent with the research development process and mechanism in the country. This necessitates the design and development of a comprehensive roadmap besides the development, implementation, and operational monitoring of comprehensive policies for the attraction, retention, and development of ethics-oriented human resources at the above mentioned areas (16).

Health Infrastructures

1. Status of Medicines Consumption Indicators

Medicine and medical supplies expenditures account for a considerable share of total health expenditures, with a dramatic increase in recent decades given the technology developments, rising public expectations, epidemiological transition, changing disease patterns from communicable to non-communicable diseases, population aging, and increased life expectancy. The results of a national study on medicines consumption in Iran suggest that the highest per capita consumption during the studied years from 2012 to 2015 are related to diabetes medicines, gastrointestinal diseases, and colds, respectively. Commonly used antibiotics have the most Rial value and the highest average per capita consumption among treatment groups is attributed to cardiovascular medicines. Annual growth rate of the numerical and Rial consumption of medicines had not a steady trend. The lowest and highest numerical growth rates are diabetes medicines. Tablets are the most widely used form of medicines. Iran's medicine consumption per capita is higher than that of the developed countries. The medicines consumption per capita of Cardiovascular and diabetes are high as compared with other medicines and treatment groups. In spite of low prices, common antibiotic medicines have the highest average Rial sales. These results are related to pharmacopeia and the use of survey data of medicines consumption in Iran may provide more accurate results; since some of these medicines may not be consumed by the consumer or end user, or they may be stored, expired or eliminated for various reasons and may be considered as medicine waste (17).

2. Human Health Resources

The health sector human resources play a significant role in provision of high quality services and promotion of society's health. A well-functioning workforce does things responsibly, fairly, and effectively to achieve the best of its possible health consequences given the available resources and conditions. Investigating the current trend and distribution of health sector human resources in Iran indicates that women have the highest proportion of human resources affiliated to the Ministry of Health and its inequality is low.

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The highest and lowest growth rates compared to baseline in 2010 is for specialists and general practitioners, respectively. In case of academic degrees, during the studied years, the lowest and highest Gini coefficients were related to Associate and Ph.D. degrees, respectively. The highest growths in the employment status index is related to scholarship faculty members and in-service commitments. The lowest Gini coefficient was related to formal and contractual cases. By increasing levels of education except for Ph.D., other degrees had an incremental growth rate. The distribution of human resources is relatively unequal at scholarship, specialist, and PhD degrees. Of course, focusing on lower-skilled human resources for delivering service may considerably justify this inequality. Since the study only considers the quantity of the human resources changes process, it is recommended to investigate the quality of human resources in future studies (18).

Policy Recommendations

Given to the above mentioned perspectives, for the better implication of policymakers in evidence-based policymaking, policy recommendations on each of the functions are presented in Table 1:

Table 1. Policy recommendations on productivity and equity in education , research and infrastructure functions

Function	Policy recommendations
Education	– Using qualitative measures along with quantitative measures in order to judge the educational performance of medical universities more accurately and fairly – Making the distribution of medical sciences students and faculty and the educational budget more equitable – Providing conditions for fellowship degree training and education in deprived provinces and maintaining trained fellowship forces – Paying attention to the limitations of Gini coefficient index in inequality policies-makings
Research	– Promotion and improvement of research inputs besides doing effective, demand-based and community-based research – Equitable distribution of research funding among medical sciences universities – Research empowerment and capacity-building through balanced development of inter-and-intra-medical-universities technology infrastructures – Balanced development of international research collaborations between and within medical universities – Institutionalization of research management and the importance of scientometrics among faculty members and students (especially higher education students) – Paying attention to the quantitative and qualitative growth of scientific production of prioritized disciplines based on the Iranian comprehensive scientific roadmap – Developing a vision and perspective for all areas of medical science – Targeted policy-making to move from first and second generation universities to the third generation (wealth-generating) and fourth generation (welfare-developing) based on Iranian social, economic and cultural values – Developing preventive legislation and policies for unethical research and publication
Infrastructures	Medicines – Adaptation and synchronization of insurance coverage of medicines based on epidemiological transition of diseases – Strengthening the clinical evaluation system through designing and implementing a clinical guideline for rational medicine administration – Public education regarding the proper and rational use of medicines – Developing educational programs with the aim of preventing arbitrary medicine use – Culturalization to change people's preference for administration of excessive medicines Human resources – Establishing gender equality in employing health workers via recruiting more men – Developing and facilitating mechanisms for converting temporary employees into formal or contractual forces, as well as converting the state of in-service commitment staffs into dedicated staffs. – Policymaking for fair distribution of human resources at scholarship, specialist and Ph.D.degrees

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Conclusion

This perspective paper describes the key issues related to the status of education, research, and infrastructures functions of health system with emphasis on medicines consumption and health sector human resources from the perspective of productivity and equity, and presented policy recommendations related to each function. Overall, it can be claimed that the efficiency of educational function is higher than that of research, and in terms of equity, there are inequalities in the quantitative indices of research and education among the universities of medical sciences in the country, although these inequalities have a declining trend with the implementation of the health transformation plan. It seems that there is a necessity to rearrange the configurement of current policies in order to provide fair education and research opportunities and to develop infrastructures for physical and human resources and budgetary mechanisms.

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Conflict of Interests

The authors state that there is no conflict of interests.

Authors' Contributions

Yazdi-Feyzabadi V proposed the idea of writing the subject as a perspective paper and provided the initial draft. Amini-Rarani M briefly reviewed relevant papers; improved the initial draft content; and extracted policy implications in consultation with other authors. Mehrolhassani MH acted as a consultant and provided valuable comments. All authors read and approved the final manuscript.

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