

## A Model for the National Mental Health Information Network

### Reza Rabiei

Ph.D. in Medical Informatics, Department of Information Management and Technology, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

### Farkhonde Aasdi ✉

Ph.D. in Health Information Management, Department of Information Management and Technology, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

E-mail: Asadifar@sbmu.ac.ir ORCID: <https://orcid.org/0000-0003-0939-7983>

### Hamid Moghaddasi

Ph.D. in Medical Informatics, Department of Information Management and Technology, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

### Mahdie Shojaei Baghini ✉

Ph.D. in Health information management, Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran.

E-mail: mahdiehsh@gmail.com, ORCID: <https://orcid.org/0000-0002-9857-7347>.

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### Abstract

**Aim:** Accurate information can be accessed in a timely manner through the Integrated Mental Health Information Network (MHIN). As Iran has no MHIN, this study was undertaken to propose an architectural model.

**Method:** This research is a sequential mixed method. The organizational structure and database structure of the MHIN was identified, and the architectural model of the NMHIN was presented in two main phases. In the first phase, a quantitative study was conducted in a scoping review with an extensive review of the background, documents, information, and available resources about the mental health information network. In the second phase, to validate the proposed architecture, the Delphi technique was implemented. Questionnaires were distributed and collected both in person and by e-mail, and finally, the data were analyzed using SPSS-19.

**Results:** The model of national MHIN was provided in five dimensions: MH entities, organizational ownership of databases, data elements of each database, linkage among databases, and exchangeable data elements among the databases.

**Conclusion:** This model can be applied as a suitable platform to effectively and efficiently store and use mental health information. So, the available information can be used for providing mental health services more comfortably and appropriately. The results showed that connecting mental health entities can create a flow of information, coordinate MHIN activities, and improve performance, efficiency, and quality of mental health.

**Keywords:** Mental health; Mental health information network; Architecture; Model

According to World Health Organization (WHO), Mental Health (MH) is a concept beyond the lack of mental diseases (1), including mental peace, feelings of ability, autonomy, adequacy, and knowing one's ability in realizing intellectual and emotional potentials (2). Therefore, disregarding MH, together with other influential factors, such as genetic history, traumatic damage to the brain, being exposed to viruses or toxic chemicals during pregnancy, using drugs, severe illnesses like cancer, wars, and unexpected disasters results in mental disorders (MDs) (3, 4). In the absence of treatment, MDs can lead to behavioral, emotional, physical, financial, and even legal problems (5).

MDs increase mental, social, and economic pressure in society and increase the risk of physical problems, including cardiovascular illnesses (6). Despite these adverse effects, most people feel uncomfortable talking about their MH issues. The reason lies in fear of being labeled by others, which results in refraining from receiving the required MH treatments (7).

Statistics show that almost a quarter of people experience one or more DMs in their lifetime (8). These disorders are the main reason for committing suicide and the fifth reason for early disability and death worldwide (4, 6). A national survey on the status of MH in Iran showed that in 2011, nearly 6.23% of people between 15 and 64 suffer from MDs. According to the latest evidence, in 2015, the country's prevalence of these disorders was about 20%, accounting for roughly 14% of its disease burden. MH is not only a lack of MDs but also includes other components that can increase the burden of psychosocial problems in the country (9).

For this purpose, WHO developed the comprehensive MH action plan 2013-2020 and asked the governments to provide the necessary financial and human resources (10). The plan focuses on the roots of MH problems and principles of human rights and has these objectives for MH: promoting leadership, providing comprehensive and integrated services and social care, developing the prevention programs, and improving mental health information network (MHIN) (11).

The collection and analysis of accurate and up-to-date data is the basis of current MH policies, which need to be comprehensive, integrated, and following society-wide goals, including MH indicators, effective treatments, preventive strategies, and MH resources (10). It is necessary to implement an information network to gather comprehensive and accurate information (6, 12).

WHO defines MHIN as a network for gathering, processing, analyzing, disseminating, and using MH information (13). According to Gater and Ndeti, an MHIN is a network that gathers, processes, and transfers MH data between all care levels (14, 15). Designing an MHIN aims to improve services' efficiency and effectiveness, promote evidence-based methods, improve inter-association cooperation, and support decisions made in all MH aspects through feedback mechanisms (13, 16-22).

To achieve these capacities, the MHIN must be established based on architectural principles. An architectural model determines the type of data gathered, stored, processed, and transferred and consists of the components and elements, the relationships among them, and the rules that govern such relationships (23-28). This structure helps the experts quickly access the information they need to provide safe, patient-oriented, coordinated, and efficient care (7). On the other hand, there are other MH providers in extensive communications with other healthcare sections, such as judicial institutions, criminal courts, labor unions, social services, and educational centers (29-31).

In Iran, the health department of the ministry of health (MOH) reports that the most critical network being used in the MH section is the hospital information system that is mostly used for financial and administrative needs, and no specific effort has been put into setting up a national mental health information network (NMHIN) (32-35). The lack of an NMHIN has led to some limitations in gathering, processing, and sharing MH data. These limitations negatively affect the quality of MH services in the country (10). Therefore, this study intended to propose an architectural model for the NMHIN.

## Method

This sequential mixed method research was carried out in two main phases, including identifying the organizational structure and database structure for the MHIN.

The United States, the United Kingdom, and New Zealand were described as pioneers in establishing a WHO's mental health information network (13,36). The review of the MOH and scientific databases provided documentation related to the architecture of the MHIN in these countries.

Subsequently, the entities involved in MH in Iran were identified, and their general functions, as well as their existing data and information were examined. The forms approved by Iran's MOH for registering MH information and related laws and regulations were also studied.

Besides, the information about the organizational and database structures, including the organizational property of databases, the set of data elements that make it up, the set of data that can be exchanged between these databases, and their relationship, were investigated. The findings of this section led to the development of an initial architectural model for NMHIN.

In the second phase, the Delphi technique confirmed the model. The panel comprised fifteen experts in health information management, clinical psychologist, and psychiatrist fields with 5 to 10 years of experience. Participants were asked to examine the organizational structure and structure of the database using two semi-structured questionnaires.

The organizational structure questionnaire's (with 10 closed questions) validity was measured by determining the validity of the content and reliability by Cronbach's alpha ( $\alpha = 0.86$ ). The database structure questionnaire's (with 37 closed questions) validity was

measured by determining the validity of the content and reliability by Cronbach's alpha ( $\alpha = 0.85$ ). For each closed question, three options, including "acceptable," "relatively acceptable," and "unacceptable," with numerical values of 3, 2, and 1 (respectively), were considered. Thus, according to the number of experts participating in the Delphi technique, each question's maximum and minimum possible points could be 45 and 15, respectively. If each item was rated above 36, it would be accepted. Questionnaires were distributed and collected both in person and by e-mail, and finally, the data were analyzed in SPSS-19.

## Results

MHIN architecture can be discussed from organizational structure and database structure perspectives. To do this, organizational and database structures of MHIN in the selected countries will first be examined (Table 1). Then, by comparing the information extracted from the studied countries and considering Iran's current situation, experts proposed the initial model of MHIN architecture and evaluated it.

All the proposed centers and departments within the organization and all the proposed centers and external departments were accepted by experts to implement the NMHIN (Table 2 & Figure1).

The data analysis results indicated that the experts fully approved all the proposed datasets for the NMHIN. The suggested datasets include demographic, administrative (organization level), patient's forensic medicine status, patient status at the time of admission, clinical, patient status at the time of discharge, human resources, and management (macro-level).

All the proposed data elements of the MOH databases were approved by 94.4% of the experts. Only the data elements about the

Center for Epidemic Diseases Management database gained the approval of 86.6% of the experts. However, all of the proposed data elements were approved with an agreement higher than 75%. Also, most of the proposed external database elements that constitute the MHIN were approved by all the experts. The data elements related to the police, drug, medical and laboratory equipment manufacturers obtained 94.4% agreement, and the data elements related to the private insurance agencies obtained 86.6% agreement. However, all of the proposed data elements were approved with an agreement higher than 75%.

The results of the how-to exchange data in the MHIN indicated that all the experts had a complete agreement with the precise definition of how to exchange data in the information network, the establishment of an electronic MH information reporting system by the Deputy of Research and Technology and also, the level of data collection and reporting from all public and private institutions providing MH services. Moreover, the experts agreed with disseminating information, from data generating centers to MH databases at medical sciences universities and then to MH databases at the MOH with a bilateral relationship among all databases forming the NMHIN with the central database (Figure 2).

## Discussion

About the organizational structure of the MHIN, investigating the NMHIN indicated that improving MH services have been targeted as one of the critical sections of this plan concerning its development and approval of its health system development plan. Considering the range of factors affecting MH, it is becoming evident that the responsibility of providing community MH goes beyond a specialized system known as the MOH or its affiliated universities. There is a need for broad intersectional coordination and

cooperation of various organizations, namely, the Imam Khomeini Relief Foundation and welfare organization, which requires prompt and timely access to accurate and precise information (10).

However, evidence suggests that there is no coherent MHIN in Iran (32,10). Therefore, the proposed model of the NMHIN was presented considering the lack of a coherent MHIN, the role that MH Network plays in improving the provision of MH services, and the laws of the MOH, especially the comprehensive MH promotion program of the country (2011-2014).

In the proposed model for the organizational structure of the NMHIN, the department of MH is considered the central body of the MOH and the leading agencies and ministries involved in the MH field surround it. This structure is similar to the MH structure in the countries under study, and the central ownership of the central database belongs to a central body formed by the MOH for centralized management of the MHIN (38-44, 32- 21). State ownership of the network will facilitate decision-making and enforcement processes in line with the MOH's statutory powers.

Moreover, the MH department was also considered responsible for managing MH activities at the level of universities of medical sciences. Other proposed centers and departments in the MH Network are the other deputies, offices, and departments shown in Table 2 and Figure 1. Among countries with MHIN, the UK National Health Service has paid more attention to the components of the MHIN. In addition to all MH institutions' databases, the database of addiction treatment centers, poor houses, forensic medicine, police, and judicial authorities also cooperate in implementing the MHIN (38,45).

In Canada, the database of education, justice, transportation, and housing departments also

collaborate in the implementation of the MHIN (46). In the United States, the department of MH services and drug abuse databases, the national institutes of health, the centers for disease control and prevention, the state insurance services center, and the department of public health and science also cooperate (47-52).

Based on the Gater and Ndetei study, the MHIN should consist of all levels of mental-community health care, primary care, and specialized MH services and collect information at different levels (14-15).

Regarding the database structure of the MHIN, all experts agreed on (100%) designing and operating a database consisting of all units presented in Table 2. Because in some diseases, including cancer, the mental burden of the disease is far more intense than the physical burden, and one's mental-spiritual state can aggravate one's physical condition. Therefore, the centers' collaboration for managing non-epidemic diseases with the MH department can be useful. Also, as the probability of committing a crime in patients with MDs is high; therefore, it is critical to identify these patients and cooperate with the police force. Manufacturers of medicines and medical and laboratory equipment can also exchange drugs and MH equipment with the MH Department (Figure 2).

They also agreed to use the National ID number to record information in the database of the NMHIN to achieve data quality, data security and prevent them from being re-recorded.

Experts also agreed with the proposed data elements of other databases forming the MHIN. The importance of being a private insurance organization in the NMHIN is that the data exchange between public and private insurers can accelerate insurance policies for these patients.

In the Manual on Mental Health Information Systems Handbook, the WHO emphasizes creating and using a minimum set of MH data to improve the decision-making process, stating that information should be collected from MH's various institutions. To collect coherent and regular data, it is necessary to employ an appropriate information network. Moreover, it is necessary to design and implement a coherent information network, a precise definition of the sources of data collection, and the type of information required (13), which means the types of data and data collection sources need to be precisely defined (53).

Also, the experts agreed on how to exchange data. The databases forming the NMHIN were linked to a central database. In this respect, the two-way communication between the police database and the central database achieved the lowest rating. In the MH policy and service guidance package, the WHO emphasizes establishing communication between the MHIN and other health information networks. It also states that the MHIN must also be connected to other departments in addition to health departments. The essential interdepartmental communications include social services, education, criminal courts, trade unions, and other departments and NGOs (10). In all countries with an MHIN, information is collected from the data sources generated and then sent to the upstream authorities after summary and integration. Eventually, the information is summarized in a government entity database - mainly the MOH - and all communications will be bilateral at the lower levels and one-way and bottom-up communications at a higher level (MOH). There are bilateral communications only in the UK, at national health services (54-65 and 43). High-level bilateral communication enables access to comprehensive, integrated, national information for all institutions. Thus,

various institutions can access the information they need, plan and make optimal decisions. If the database of regional databases is missed for some reason, it is possible to rebuild the database faster and easier by requesting information from the National Health Service.

It should be noted that the proposed architecture model for Iran covers all stages of information management - collection, process, analysis, dissemination, and use of MH information.

### Conclusion

The NMHIN architecture model was provided in five dimensions: the MH entities, the organizational property of the databases, the data elements of each database, the linkage between the databases, and the exchangeable data elements.

The benefits and features of this model include:

- Transparency and simplicity
- Applicability in the country because of its alignment with the healthcare delivery structure
- Helping to create and develop the NMHIN in the country
- Laying the groundwork for improving service delivery and developing the MH system
- Improving the efficiency and effectiveness of quality MH care
- Promoting evidence-based practices and improving inter-institutional collaboration to facilitating the collection, processing, analysis, distributing, and sharing of data
- Facilitating the planning and decision making

- Monitoring, evaluating, and developing services
- Improving the quality of care
- Preventing diseases and promoting health
- Reducing costs
- Carrying out research due to rapid access to information

### Limitations & suggestions

This study has some limitations in providing up-to-date statistics on the prevalence of MDs in Iran and around the world. Furthermore, according to the limitations of similar studies in NMHIN, by investigating the MHIN in countries, a careful study of the country's MH structure, and using experts' views in the related fields, the researchers designed and proposed an NMHIN architecture model. The study results indicated the proposed model's applicability; however, it is suggested to implement and evaluate the proposed model in future studies.

### Disclaimer Statements

**Conflicts of Interests:** None

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**Table 1:** The Organizational Database Structure of the MHIN in the Selected Countries

Component Country	United Kingdom	United States	New Zealand
Name of the project	Mental Health Care Database (IMHER)	State Mental Health Information System	Program for the Integration of Mental Health Data (PRIMHD )
Ownership at National Level	National Health Services (NHS)	Department of Health & Human Services (DHSS)	MOH
Policy-Maker organizations & Data Sources	<ul style="list-style-type: none"> <li>-Mental Health Trust</li> <li>-Poor House</li> <li>-Police</li> <li>- Judicial Authorities</li> <li>-forensic medicine</li> <li>-Center for Substance use Treatment</li> </ul>	<ul style="list-style-type: none"> <li>-Substance use and Mental Health Services Administration (SAMHSA)</li> <li>-National Institutes of Mental Health (NIMH)</li> <li>-Centers for Disease Control and Prevention (CDC)</li> </ul>	<ul style="list-style-type: none"> <li>-Chief Advisor (Mental Health)</li> <li>-Mental Health Review Tribunal in Accident Compensation Corporation</li> <li>-20 District Health Boards (DHBs)</li> </ul>
Data Sets of Mental Health Information Network	<p>Demographic Information/ Geography/ Referral Source/ Legal Status of the Patient/ Discharge/ Visit/ Counseling/ Treatments/ Evaluation of Patient's Response to Treatment/ Status of Patient Admission/ Conditions of Discharge/ Status of Homeless Patients.</p>	<p>-SAMHSA has developed mental health specific indicators, called National Outcome Measures (NOMs). SAMHSA's indicators include reduced morbidity, employment, education, housing stability, and social connectedness, access to care, and retention in and perception of care.</p> <p>-The Medicare program and many private health insurers use the Healthcare Effectiveness Data and Information Set (HEDIS) to measure mental health care quality. The measures in HEDIS include medication management for anti-depressants, follow-up after hospitalization for mental illness, and utilization of mental health care services.</p> <p>-AHRQ produces two congressionally mandated reports on the quality of health care annually. The indicators that AHRQ uses to measure effectiveness of mental health care are suicide death rate, based on data from the HHS's National Vital Statistics System, and receipt of treatment for major depression, based on the HHS's National Survey on Drug Use and Health.</p>	<p>Healthcare User/ Legal Status/ Referral Discharge/ Activity/ Classification/ Collection Occasion/ Outcome Tool/ Outcome Item.</p>

Component Country	United Kingdom	United States	New Zealand
Sources of information	Inpatients/ Outpatients and Community Mental Health Care Services/ Private Mental Health Providers/ NHS Trusts/ Clinical commissioning groups/ Hospital services/ Primary Care/ Specialist services/ Public health/ Mental Health Trust/ Poor House/ Police/ Judicial Authorities/ Forensic Medicine/ Drug Addiction Treatment Centers	In accordance with state laws, all Mental Health and Substance use Institutions.	Psychiatric Hospitals/ General Hospitals/ Publicly Funded Hospitals/ Non-Governmental Organizations/ Residential and Supported Accommodation Services/ Community Mental Health and Addiction Services
Reporting Levels	National Regional The State	National The State	National The State

**Table 2:** The Proposed External Entities in the National Mental Health Information Network

Suggested entities (within in the MOH and Medical Education)	Percent	Suggested entities (outside the MOH and Medical Education)	Percent
Deputy of Treatment	100	Ministry of Cooperatives, Labour, and Social Welfare	100
Deputy of Education	100	Ministry of Education	100
Deputy of Health	100	Ministry of Science Research and Technology	100
Deputy of Development and Resources	100	Ministry of Roads, Urban Development	100
Deputy of Research and Technology	100	Ministry of Culture and Islamic Guidance	100
Food and Drug Administration	100	Ministry of Economic Affairs and Finance	100
Medical Sciences Universities	100	Ministry of Sport and Youth	100
Health Centers	100	Ministry of Information and Communications Technology	100
Training and Health Promotion Office	100	Ministry of Information	100
Mental, Social and Addiction Office	100	Police Force	100
Family Health Office, School Population	100	Forensic Medicine Organization	100
Contagious Disease Management Center	94.4	Social Security Organization	100
Noncontagious Disease Management Center	100	Health Insurance Organization	100
Social Health Administration	100	Private Insurance Organizations	100
Office of Addiction	100	Social Work Organization	100
Permanent Commission on Mental Health and Addiction in the High Council for Health and Food Security of the country	100	Welfare Organization	100
Iran Drug Control Headquarters	100	Imam Khomeini Relief Foundation	100
Organization of Psychology and Consultation	100	Camps	100
Manufacturers of medical and laboratory equipment	100	-	-

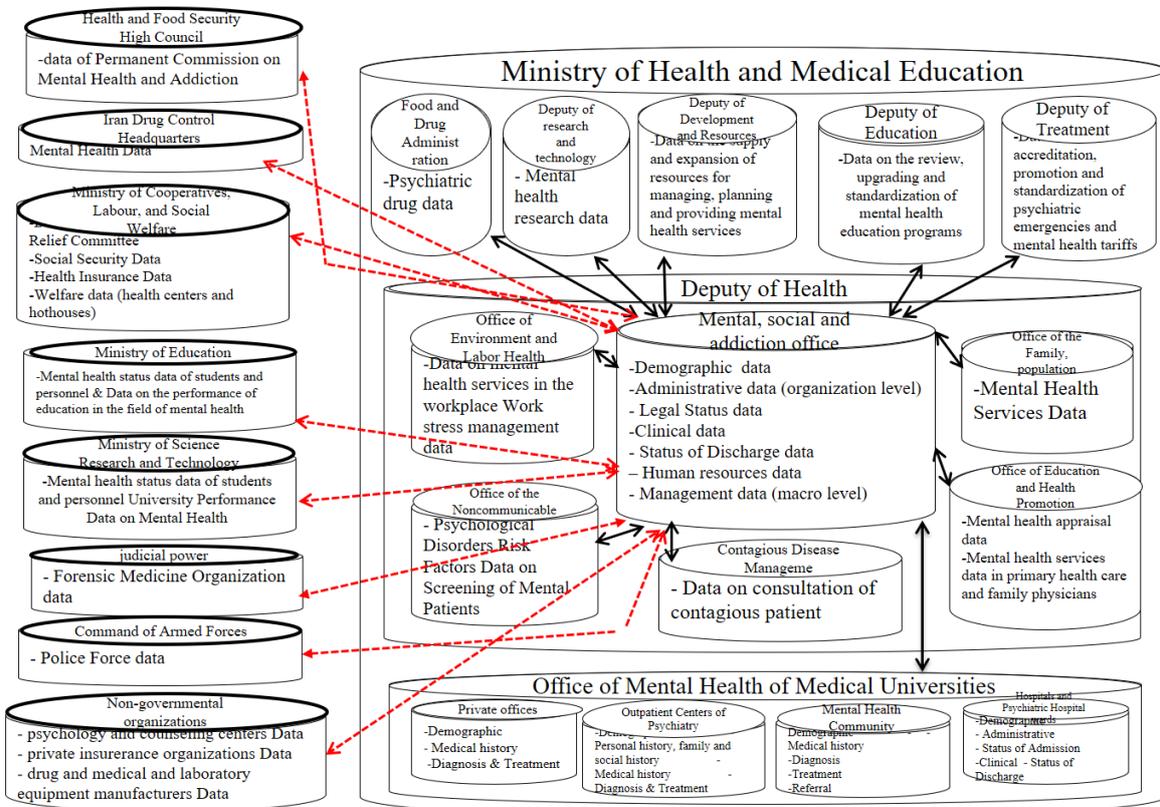
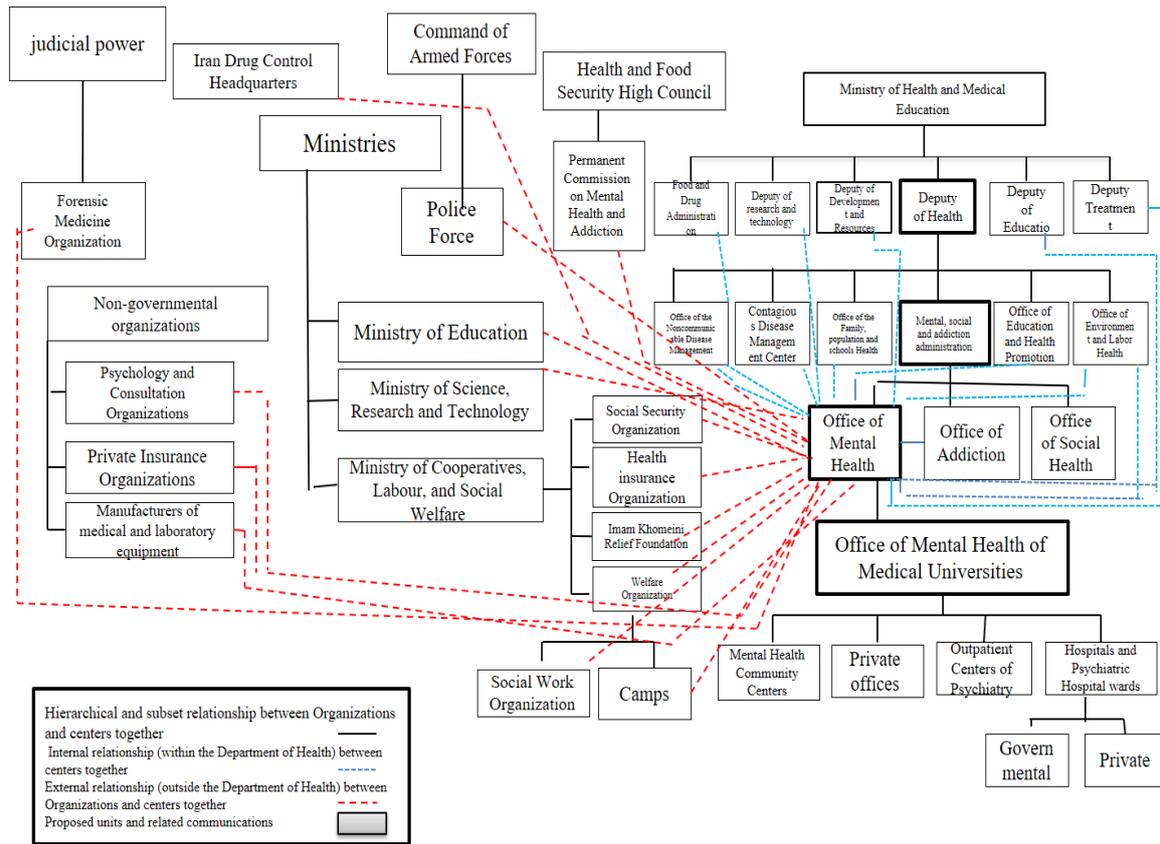


Figure 2: Final Architecture Model of Iran Mental Health Information Network with Database Approach

## References

1. WHO. Mental health: a state of well-being. 2019[cited 2021]; Available from: [http://www.who.int/features/factfiles/mental\\_health/en/](http://www.who.int/features/factfiles/mental_health/en/).
2. WHO. Mental health. Available from: [http://www.who.int/topics/mental\\_health/en/](http://www.who.int/topics/mental_health/en/).
3. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th `Ed.). Arlington, VA: American Psychiatric Publishing. 2013. pp. 101–05. ISBN 978-0-89042-555-8.
4. WHO. Mental health atlas. 2014[cited 2021]; Available from: [http://apps.who.int/iris/bitstream/10665/178879/1/9789241565011\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/178879/1/9789241565011_eng.pdf?ua=1).
5. NLM. Mental health. 2015[cited 2021]; Available from: <http://www.nlm.nih.gov/medlineplus/mentalhealth.html>.
6. The National Institute of Mental Health. Chronic illness and mental health. 2021[cited 2021]; Available from: <https://www.nimh.nih.gov/health/publications/chronic-illness-mental-health/index.shtml>.
7. Rössler W. The stigma of mental disorders: A millennia-long history of social exclusion and prejudices. *EMBO Rep.* 2016;17(9):1250–3.
8. WHO. 10 facts on mental health. 2019[cited 2021]; Available from: [http://www.who.int/features/factfiles/mental\\_health/mental\\_health\\_facts/en/](http://www.who.int/features/factfiles/mental_health/mental_health_facts/en/).
9. Deputy of Health, Ministry of Health and Medical Education. Comprehensive mental health improvement program of Iran (2014-2014) based on Iran health system development map. Iran: Ministry of Health and Medical Education: 2015 [In Persian].
10. WHO. Mental health policy and service guidance package: mental health policies and programs in the workplace. 2005[cited 2021]; Available from: [https://www.who.int/mental\\_health/policy/services/13\\_policies%20programs%20in%20workplace\\_WEB\\_07.pdf](https://www.who.int/mental_health/policy/services/13_policies%20programs%20in%20workplace_WEB_07.pdf).
11. WHO. Comprehensive mental health action plan 2013–2020. Sixty-sixth World Health Assemblies. [cited 2021]; Available from: [http://www.who.int/mental\\_health/action\\_plan\\_2013/en/](http://www.who.int/mental_health/action_plan_2013/en/).
12. National Institute of Mental Health. Exploratory clinical trials of novel interventions for mental disorders (R61/R33) [cited 2021]; Available from: <http://grants.nih.gov/grants/guide/rfa-files/RFA-MH-16-406.html>.
13. WHO. Mental health information systems, WHO mental health policy and service guidance package - module 12. 2005[cited 2021]; Available from: [https://www.who.int/mental\\_health/policy/mnh\\_info\\_sys.pdf](https://www.who.int/mental_health/policy/mnh_info_sys.pdf).
14. Ndeti DM, Jenkins R. The implementation of mental health information systems in developing countries: Challenges and opportunities. *Epidemiol Psychiatr Sci.* 2009;18(1):12–6.
15. Gater R, Bahgat F, Loza N. Mental Health Information Systems. *Ment Health (Lond).* 2009;6:2.
16. Amaddeo F, Barbui C, Perini G, Biggeri A, Tansella M. Avoidable mortality of psychiatric patients in an area with a community-based system of mental health care. *Acta Psychiatr Scand.* 2007;115(4):320–5.
17. WHO. Mental health policy and service guidance package, mental health information systems. Geneva: WHO; 2005.
18. Williams AB, Coughlin B, Frazier J, Penelope Hughes JD, John Rancourt MPA, Shah S. Issue brief: Behavioral health and health IT. *Off Natl Coord Heal Inf Technol Dep Heal Hum Serv.* 2013[cited 2021]; Available from: [www.healthit.gov/sites/default/files/bhandhit\\_issue\\_brief.pdf](http://www.healthit.gov/sites/default/files/bhandhit_issue_brief.pdf).
19. Padshah, S. Mental health information system implementation in the Rouge Valley health system. Performed at Rouge Valley Health System. In fulfillment of the practicum requirement of the Master of Health Informatics Program. Canada: Dalhousie University; 2011.
20. Trafton JA & et al. VHA mental health information system: applying health information technology to monitor and facilitate the implementation of VHA Uniform Mental Health Services Handbook requirements. *Med Care.* 2013; 3 ( 1):S29-36.
21. Minas H. The Centre for International Mental Health approach to mental health system development. *Harv Rev Psychiatry.* 2012;20(1): 37–46.
22. Sommerville. *Software engineering.* Pearson, 9th edition, USA, 2011.
23. Zachman JA. A framework for information systems architecture. *IBM Syst J.* 1999;38(2.3):454–70.
24. Locatelli P, Restifo N, Gastaldi L, Corso M. Health care information systems: architectural models and governance. *Innov Inf Syst Model Tech.* 2012;71–96.
25. Rodrigues, J. *Health information systems: concepts, methodologies tools, and applications.* Washington DC: Hershey (PA); 2010.
26. Chen, L. & et al. An architecture model for multiple disease management information systems. *J Med Syst* 2013; 37(9931).
27. Power, DJ. *Information system architecture.* [cited 2021]; Available from: <http://dssresources.com/glossary/116.php>.
28. Vasconcelos, A. Sousa, P. & Tribolet, J. *Information system architectures: representation, planning, and evaluation.* Systemics, Cybernetics and Informatics 2003; 1 (6).
29. Health Policy Ohio. *The National health information infrastructure and population health.*

2007. [cited 2021]; Online. Available at: <http://www.healthpolicyohio.org/>.
30. WHO. WHO assessment instrument for mental health systems (AIMS) Version 2.1. Geneva: WHO; 2005.
  31. Garfield, RG. & et al. The impact of national health care reform on adults with severe mental disorders." *American Journal of Psychiatry* 2011; 168(5): P.486-494.
  32. Network Management Center, Deputy of Health, Ministry of Health and Medical Education. Implementation guidelines for the provision of primary health care programs in the suburbs, informal settlements and cities between 20,000 and 50,000. Version 0/1. Iran: Ministry of Health and Medical Education: 2013 [In Persian].
  33. Nourbala A A. Psychosocial health and ways to improve it. *Iranian Journal of Psychiatry and Clinical Psychology*, Vol. 17, No. 2, Summer 2011, 151-156 [In Persian].
  34. Deputy of Health, Isfahan University of Medical Sciences. [cited 2018]; Available from: <http://phcmail.mui.ac.ir/index.php/1389-12-05-15-09-24/1389-12-24-15-57-41/1390-01-30-14-05-58.html> [In Persian].
  35. Deputy of Health, Tehran University of Medical Sciences. Strengthening and expanding the program of integrating mental health into the primary health care system. Available from: <http://health.tums.ac.ir/fa/1311.aspx> [In Persian].
  36. Ministry of Health. New Zealand health system. [cited 2018]; Available from: <https://www.health.govt.nz/new-zealand-health-system>.
  37. Habibi A, Sarafrazi A, Izadyar S. Delphi technique theoretical framework in qualitative research. *Int J Eng Sci*. 2014;3(4):8-13.
  38. NLM. Mental health. 2015[cited 2021]; Available from: <http://www.nlm.nih.gov/medlineplus/mentalhealth.html>.
  39. Rouhani Rankankuhi M T. Basic Concepts Tehran Database: Jelveh; 2014 [In Persian].
  40. Ministry of Health. New Zealand health system. 2018[cited 2021]; Available from: <https://www.health.govt.nz/new-zealand-health-system>.
  41. Marais DL, Petersen I. Health system governance to support integrated mental health care in South Africa: challenges and opportunities. *Int J Ment Health Syst*. 2015;9(1):1-21.
  42. Mental Health and Poverty Project - Ghana Team. Mental health information system- Ghana, Policy Brief. Ghana: Department of Psychiatry, University of Ghana Medical School/Ministry of Health Partner; 2010.
  43. Russler, D. The national health information network & its implications for a national rare disease patient registry/case study. United States: Office of rare diseases research, national institutes of health; 2009. [cited 2021]; Available from: <http://rarediseases.info.nih.gov/files/russler.pdf>.
  44. Padshah, S. Mental health information system implementation in the Rouge Valley health system. Performed at Rouge Valley health system. In fulfillment of the practicum requirement of the Master of Health Informatics Program. Canada: Dalhousie University; 2011.
  45. HSCIC. Mental health services data set (MHSDS) v1.1, implementation guidance. 2009. [cited 2021]; Available from: <http://www.hscic.gov.uk/statistics-and-data-collections/data-collections/information-supporting-our-data-collections>.
  46. COACH Canada. Health informatics. [cited 2018]; Available from: [http://www.coachorg.com/COACH/health\\_informatics/about\\_health\\_informatics.htm](http://www.coachorg.com/COACH/health_informatics/about_health_informatics.htm).
  47. Centers for Disease Control and Prevention. Program performance and evaluation office. [cited 2021]; Available from: <http://www.cdc.gov/mentalhealth/about-us.htm>.
  48. MHA. Mental Health America. [cited 2018]; Available from: <http://homeless.samhsa.gov/resource/Mental-Health-America-167.aspx>.
  49. National Institute of Mental Health. Exploratory clinical trials of novel interventions for mental disorders (R61/R33). [cited 2021]; Available from: <http://grants.nih.gov/grants/guide/rfa-files/RFA-MH-16-406.html>.
  50. Centers for Medicare and Medicaid Services. Increasing interoperability in health information systems: for medicaid, mental health, and substance abuse treatment. [cited 2018]; Available from: [http://csat.samhsa.gov/IDBSE/idb/modules/FINAL-CMS\\_SAMHSA\\_InteroperabilityConfPapers.pdf](http://csat.samhsa.gov/IDBSE/idb/modules/FINAL-CMS_SAMHSA_InteroperabilityConfPapers.pdf).
  51. Croghan TW, Brown JD. Integrating mental health treatment into the patient-centered medical home. (Prepared by Mathematica Policy Research under Contract No. HHS290200900019I TO2.) AHRQ Publication No. 10-0084-EF. Rockville, MD: Agency for Healthcare Research and Quality. June 2010.
  52. Sundararaman R. US mental health delivery system infrastructure: A primer. DIANE Publishing; 2009.
  53. Lotfnezhadafshar H, Zareh fazlollahi Z, Khoshkalam M, Rezaihacheso P. Comparative study of Mental health registry system of United Kingdom, Malaysia and Iran. *Health Information Management Journal*. 2009; 6( 1): 1-10 [In Persian]
  54. Ministry of Health. PRIMHD data process standard. HISO 10023.1:2015. Version 2.2.2. [cited 2018]; Available from: <http://www.ithealthboard.health.nz/who-we-work/hiso/standards/approved-standards>.

55. Ministry of Health. National mental health information strategy 2005–2010. New Zealand: Ministry of Health; 2005.
56. Harding Elisabeth. Privacy impact assessment and commentary on the mental health information project for New Zealand health information service. [cited 2018]; Available from: <http://www.nzhis.govt.nz/documentation/mhinc/ak983340.pdf>.
57. Ministry of Health. HISO 10023:2015 Project for the integration of mental health data (PRIMHD). 2017[cited 2021]; Available from: <http://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primhd-mental-health-data/primhd-standards>.
58. HSCIC. Mental health services data set: Key messages [cited 2018]; Available from: [http://www.hscic.gov.uk/media/18640/The-MHSDS-key-messages/pdf/Final\\_MHSDS\\_messages\\_for\\_website\\_PDF.pdf](http://www.hscic.gov.uk/media/18640/The-MHSDS-key-messages/pdf/Final_MHSDS_messages_for_website_PDF.pdf).
59. HSCIC. Mental health services data set (MHSDS) v1.1, implementation guidance. [cited 2018]; Available from: <http://www.hscic.gov.uk/statistics-and-data-collections/data-collections/information-supporting-our-data-collections>.
60. HSCIC. Data sets. [cited 2018]; Available from: <http://www.hscic.gov.uk/datasets>.
61. Ofori-Atta A, Read UM, Lund C. A situation analysis of mental health services and legislation in Ghana: challenges for transformation. *Afr J Psychiatry*. 2010;13(2).
62. Roberts M, Asare JB, Mogan C, Adjase ET, Osei A. The mental health system in Ghana. *Ghana Kintampo Proj*. 2013[cited 2021]; Available from: <https://www.mhinnovation.net/sites/default/files/downloads/innovation/research/The-Mental-Health-System-in-Ghana-Report.pdf>.
63. SAMHSA. SAMHSA's data integrity statement. [cited 2018]; Available from: <http://www.samhsa.gov/data/data-integrity-statement>.
64. Barch DM, Gotlib IH, Bilder RM, Pine DS, Smoller JW, Brown CH, et al. Common measures for National Institute of Mental Health funded research. *Biol Psychiatry*. 2016;79(12):e91–6.