



Physician preferences for working in deprived areas: a systematic review of discrete choice experiment

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Received: 19 Jul 2018

Published: 14 Aug 2019

Abstract

Background: Physician shortages in rural areas is a universal concern, and most countries face this challenge. Many attributes influence the physician preferences about the choice of working location. The aim of this systematic review was to investigate which attributes were included in discrete choice experiment studies and which of them valued the most by physicians.

Methods: The following databases were searched: PubMed, Embase, and Web of Science Core Collection. Further studies were retrieved from reference lists of included studies, and grey literature. Studies used discrete choice experiments methods to elicit preferences for working in the deprived area, focus on physicians or medical students, and published between 2000 and 2017 in the English language were included.

Results: The literature search yielded 192 studies, of which 14 studies met inclusion criteria. The attributes and attribute levels were identified by literature review and qualitative research. The number of attributes varied from five to ten, and the most frequent number was six attributes. In most studies, maximum of sixteen different scenarios were given to the study samples. The “salary or income” attribute was the most important in fifty percent of the studies and the attributes related to “study and education” was at the next level.

Conclusion: Financial attributes are not the only significant attributes considered by the physicians for deciding where to practice, but also the other non-financial attributes are important. It is suggested that based on the economic, social and cultural conditions of each country, a specific incentive package, including a set of financial and non-financial incentives, is developed to attract physicians to the deprived areas.

Keywords: Physician, Discrete choice experiment, Preference, Deprived area, Systematic review

Conflicts of Interest: None declared

Funding: Tehran University of Medical Sciences

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Cite this article as: Hamouzadeh P, Akbarisari A, Olyaeemanesh A, Yekaninejad MS. Physician preferences for working in deprived areas: a systematic review of discrete choice experiment. *Med J Islam Repub Iran.* 2019 (14 Aug);33:83. <https://doi.org/10.47176/mjiri.33.83>

Introduction

Inadequate number of qualified health personnel in deprived areas impedes equity access to healthcare and the health demands of the population. Therefore, encouraging physicians to work in deprived areas is the biggest challenge facing health system policymakers (1, 2). There is an alarming shortage of health personnel such as physicians in deprived areas in both developing and developed countries. In Canada (3) and the United States (4), about 9% of physicians live in remote areas, while less than a

quarter of the population live in these areas. In Senegal, the Dakar region has more than 60% of the country's physicians, but have only 23% of the total population (5). In Sudan, the physician-to-population ratio in the urban area is 24 times higher than in rural area (6). In India, nearly three-fifths of health workers be in urban areas with almost one-quarter of the country's population (7).

Studying the job preferences of physicians toward working in deprived areas, plays an important role in iden-

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↑What is “already known” in this topic:

Despite numerous attempts to encourage physicians to work in deprived areas, this issue continues to be a major challenge for the health system in most countries.

→What this article adds:

For persuading the physician for practice in the deprived areas, a specific incentive package including financial and non-financial incentives must be provided to them.

tifying attraction or retention incentives for physicians in this area. A technique that has been widely used for this purpose is the discrete choice experiment (DCE). DCE is an appropriate technique to elicit the stated preferences (8). DCE systematically quantifies the job preferences of physicians, and measure the trade-offs physicians place on various attributes of a job (9). DCE has been used to elicit health personnel preferences about working in the deprived area in several studies (10-18).

The aim of this systematic review was to investigate which attributes were included in discrete choice experiments studies and which of them valued the most by physicians. The results of this review can offer useful information on where attributes policies should be focused to improve the attraction and retention of physicians in deprived areas.

Methods

Sources

The following databases were systematically searched: PubMed, Embase, and Web of Science Core Collection. Further relevant studies were retrieved from reference lists of included studies, and grey literature.

Search study

Medical Subject Headings (MeSH) or free-text were used in three concepts.

Physician: “physician”, “doctor”, “surgeon”, “medical” or “practitioner”.

Deprived area: “rural”, “remote”, “deprived area”, “underdeveloped area”, “underserved area” or “disadvantaged area”.

Discrete choice experiment: “discrete choice”, “choice method”, “choice experiment”, “choice analysis”, “choice modelling”, “stated preference”, “job preference” or “job attribute” (Appendix 1).

Inclusion and exclusion criteria

Studies were included in this review if they were: (a) an original study, (b) used discrete choice experiments methods to elicit preferences for working in the deprived area, (c) focus on physicians or medical students, and (d) published between 2000 and 2017 in the English language.

Studies were excluded if they were focused on non-physician workforce, not written in the English language, and published before 2000.

Selection process

For the selection of studies, two levels of screening were used. At first, titles and abstracts of studies screened by two reviewers independently to select potentially eligible studies. And then, the full-texts of potentially eligible studies, selected by at least one reviewer, were obtained and evaluated by two reviewers independently to see whether they met the inclusion criteria. Disagreements among the reviewers were resolved through consensus or by a third reviewer.

Data extraction

The data of included studies were extracted using a checklist designed by the researchers. The following data were extracted from the included studies: authors, country, year of study, sample size, response rate, attributes, levels, number of scenarios, and most important attribute.

Results

Study selection

The literature search yielded 192 studies: 57 from PubMed, 69 from Embase, 63 from Web of Science Core Collection, and three through the additional hand search. Eighty-two duplicates were removed, and after the exclusion by titles and abstracts, 34 studies were included in the full-text review. Of the 34 studies reviewed in detail, 20 were excluded [focus on non-physician workforce (n=7), and not related to our aim (n=13)]. Finally, 14 DCE stud-

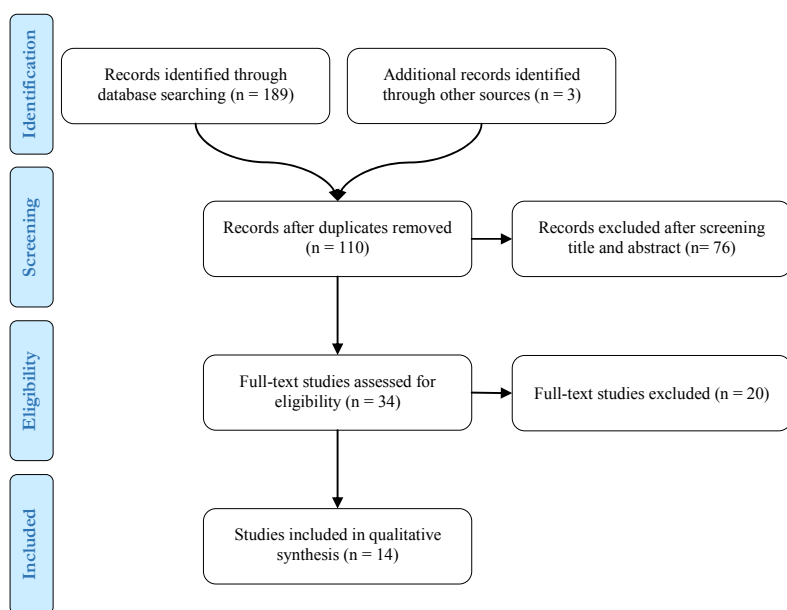


Fig. 1. Study selection process based on PRISMA protocol

ies (15-28) were included in this systematic review (Fig. 1).

Study characteristics

The main characteristics of the included studies are shown in table 1. Almost 70% of included studies have been published in the last 5 years. The number of attributes varied from five to ten, and the most frequent number was six attributes (n=6). The number of scenarios varied from nine to twenty-four. In most studies, maximum of sixteen different scenarios were given to the study samples (n=6). The sample of seven studies were in-service physicians, in five studies were medical students and in two studies were both in-service physicians and medical students. In all, 4004 in-service physician and 2594 medical students investigated in the included studies. The sample size was <500 in twelve and >500 in two of the studies. Most of the studies had a response rate of more than 80%. Two studies reported a response rate of less than 60% and one study between 60% and 80%. Most studies were conducted in Asia (16, 17, 19, 23-25, 28). Other studies were performed in Africa (20, 22, 26, 27), America (15, 18), and Europe (21) (Table 1).

Attributes and attribute-levels

Researchers used different methods to identify the attributes and levels. The most widely used methods in the included studies were qualitative research such as interviews and focus group discussions (FGD) (n= 13). Five studies used literature review methods to identify attributes and attribute-levels. Some studies used a combination of methods to identify attributes. For example, Rana and Sarfraz (16) performed a literature review with three in-depth interviews and six FGD with senior health managers, medical officers, and medical students to identify attributes and attribute-levels. Overall, 4 studies (29%) used two common methods (literature review and qualitative research) to identify attributes and attribute levels, and one study did not report the method of identifying the attributes (Table 2).

Preferences for physicians to work in rural areas

An overview of the attributes, levels and the most important attribute in each study are shown in table 3. Based on the results of the included DCE studies, the attribute

Table 1. Main characteristics of included studies

	Number of studies (%)
Sample	
In-service physicians	7 (50%)
Medical students	5 (36%)
Both	2 (14%)
Number of attributes	
5 attributes	1 (7%)
6 attributes	6 (43%)
7 attributes	4 (29%)
8 attributes	2 (14%)
10 attributes	1 (7%)
Number of Scenarios	
12 or less scenarios	5 (36%)
13-16 scenarios	7 (50%)
17 or more scenarios	2 (14%)
Sample size	
<500	12 (86%)
>500	2 (14%)
Response rate	
<60%	2 (14%)
60%-80%	1 (7%)
>80%	11 (79%)
Continent	
Africa	4 (29%)
America	2 (14%)
Asia	7 (50%)
Europe	1 (7%)

Table 2. Methods to identify attributes and attribute-levels

Methods	Number
Literature review	4
Qualitative research	13
Not-reported	1

The sum is greater than included studies and the percentage is more than 100%, because some studies used more than one method

“salary or income” was the most important in fifty percent of the studies (15, 16, 18, 20, 23, 24, 26). All the study concluded that higher salary or income had the biggest impact on the willingness of in-service physicians or medical students to work in deprived areas. Although the results of most studies (50%) showed that increase income was the most important attributes from the viewpoint of respondents, Holte et al. (21) showed that increased income seem to have less impact as compared to improvements in the non-pecuniary attributes. Furthermore, four studies showed that attributes related to “study and education”, such as “receiving study assistance” (19), “providing long-term education” (17), “tuition for future schooling” (27), and “training and education” (28) had the highest importance for the respondents. The results of other

Table 3. Overview of attributes, attribute levels, and main results

No.	Authors, year	Country	Attributes (Levels)	Important attribute
1	Hanson, 2010	Ethiopia	1. Location (Addis Ababa vs. Zonal capital), 2. Monthly pay (Base/ Base+50%/ Base+100%), 3. Housing (None/ Basic/ Superior), 4. Equipment and drugs at facility (Inadequate vs. Improved), 5. Time commitment per year of training (Two years vs. One year), 6. Private-sector work permitted (Yes vs. No)	Higher wages
2	Kruk, 2010	Ghana	1. Salary (Base/ Base+30%/ Base+50%/ Base+100%), 2. Children's education (No allowance vs. Allowance), 3. Infrastructure (Basic vs. Advanced), 4. Management style (Supportive vs. Unsupportive), 5. Years of work before study leave (5 years vs. 2 years), 6. Housing (Not provided/ Free basic provided/ Free superior provided), 7. Transportation (Utility car not provided vs. Utility car provided)	Improved equipment
3	Vujicic, 2011	Vietnam	1. Location (Remote rural area vs. Urban center area), 2. Equipment (Inadequate vs. Adequate), 3. Official Income (4 million VND/ 8 million VND/ 12 million VND/ 16 million VND/ 20 million VND), 4. Skills Development (No program vs. Short-term courses), 5. Long-term Education (None vs. Possibility to enter advanced medical school after 5 years on the job); 6. Housing (None vs. Government-provided)	Long-term education

Table 3. Ctd

No.	Authors, year	Country	Attributes (Levels)	Important attribute
4	Miranda, 2012	Peru	1. Type of health facility (Health center vs. Regional hospital), 2. Monthly salary (2,500 PEN/ 3,125 PEN/ 3,700 PEN/ 4,375 PEN), 3. Time in post before getting a permanent job (3 years vs. 6 years), 4. Points when applying for a residency in Community and Family Medicine, after 3 years in post (10 points vs. 20 points), 5. Free housing provided (A shared room in a residence with shared facilities vs. A two-bedroom independent house), 6. Work schedule (You work 22 days and then have 8 days off vs. You work 18 days and then have 12 days off), 7. Free days for continuous medical education (7 free days a year vs. 14 free days a year)	Increased salary
5	Rockers, 2012	Uganda	1. Salary per month (700,000 USh/ 1,000,000 USh/ 1,500,000 USh/ 2,000,000 USh), 2. Facility quality (Basic vs. Advanced), 3. Housing (No housing or allowance provided/ Housing allowance provided, enough to afford basic housing/ Free basic housing provided), 4. Length of commitment (2 years vs. 5 years), 5. Support from manager (Not supportive vs. Supportive), 6. Future tuition (Not provide any financial assistance vs. Provide full tuition for a study program)	Future tuition
6	Rao, 2013	India	1. Staff (Few staff and heavy workload vs. Fully staffed and moderate workload), 2. Area (Located in a poorly connected place with bad education facility for children and poor housing provided/ Located in a poorly connected place with bad education facility for children but good housing provided/ Located in a well-connected place, having good education facilities for children but poor quality housing provided/ Located in a well-connected place, having good education facilities for children and good quality housing provided), 3. Health center infrastructure (Building in poor condition, inadequate equipment, and frequent shortages of supplies and drugs vs. Well-maintained building, adequately equipped with few shortages of supplies and drugs), 4. Salary (30000 Rs/ 45000 Rs/ 65000 Rs/ 80000 Rs), 5. Change in location to city or town (Uncertain vs. On completion of 3 years), 6. Professional development (Short-duration training courses for skill development/ Easier admission to PG after 3 years of service in same job through reservation), 7. Job location (Not located in your native area vs. Located in your native area), 8. Type of health center (Clinic/ Small hospital (20–30 beds)/ Large hospital (50–100 beds))	Good education facilities for children
7	Lagarde, 2013	Thailand	1. Hospital size (Small (10–60 beds) vs. Large (>60 beds)), 2. Hospital location (In or near your home province vs. A province far from your home province), 3. Your monthly salary (Base/ Base+15%/ Base+30%; Base+45%), 4. Night shifts per month (7 vs. 14), 5. Presence of a consultant in the facility (Yes vs. No), 6. Reserved quota for subsequent specialist training (Yes vs. No), 7. Number of years you have to wait to be promoted to the next grade (1 vs. 2)	Increased salary
8	Rafiei, 2015	Iran	1. Location (Rural vs. Urban), 2. Income (Base/ Base+100%; Base+150%; Base+200%), 3. Dual practice (Yes vs. No), 4. Workload (Light/ Moderate/ Heavy), 5. Proximity to family (Yes vs. No), 6. Clinical infrastructure (Inadequate vs. Adequate), 7. Housing (None/ Basic/ Superior), 8. Educational facilities (Basic vs. Superior)	Increased salary
9	Robyn, 2015	Cameroon	1. Career development (No preferential admission for health workers in rural areas for ongoing training available vs. Establishment of preferential admission for ongoing training available to your level via a quota of 20% of seats reserved for those who worked for at least 4 years in rural areas), 2. Accessibility and connectivity of the workplace to the city (Your facility is located in a village with poor connectivity - reliable transportation to the health district capital twice a week or less vs. Your facility is located in a village with good connectivity - reliable transportation to the health district capital every day), 3. Health facility infrastructure (Lack of equipment, drugs and so on vs. Adequate equipment, drugs and so on), 4. Lodging (No accommodation provided vs. A good quality house is made available in a secure location with access to drinking water), 5. Salary (Base/ Base+25%/ Base+50%/ Base+75%), 6. Job assignment in an urban area (Uncertain vs. Automatic after 3 years)	Bonus of 75% of base salary
10	Efendi, 2015	Indonesia	1. Quality of facility (Basic vs. Advanced), 2. Housing (No housing or allowance provided/ Housing allowance provided, enough to afford basic housing/ Free basic housing provided), 3. Length of commitment (1-year vs. 2-year), 4. Study assistance (Not provide any financial assistance vs. Provide full tuition), 5. Salary per month (3 million IDR/ 5 million IDR/ 7 million IDR/ 10 million IDR), 6. Management (Limited support vs. Full support)	Study assistance
11	Holte, 2015	Norway	1. Location (<5000 inhabitants/ 5000-14,999 inhabitants/ 15000-49,999 inhabitants/ >50 000 inhabitants), 2. Opportunity to control working hours (Limited vs. Very good), 3. Opportunity for professional development (Limited vs. Very good), 4. Income (10% less than average salary for hospital doctors/ Equal to the average salary for hospital doctors/ 10% above the average salary for hospital doctors/ 20% above the average salary for hospital doctors), 5. Practice size (1-2 doctors/ 3-5 doctors/ 6 doctors or more)	Non-pecuniary attributes
12	Rana, 2016	Pakistan	1. Career Promotion (Commitment for two years/ Commitment for 3 years and then upgrading/ Commitment for 5 years and then upgrading), 2. Quality of the Facility (Basic vs. Advanced), 3. Salary (Base+10%; Base+30%, 15% annual increment/ Base+50%, 10% annual increment), 4. Living Condition (No housing facility/ Housing and security allowance/ Housing availability with basic amenities), 5. Transportation (Availability of transport vs. Transport allowances), 6. Study Assistance (No support/ Partial Financial support/ Full Financial support)	High salary
13	Smitz, 2016	Timor-Leste	1. Facility type (Community Health Center vs. Health Post), 2. Location (Urban/ Remote/ Extremely remote), 3. Health Facility Equipment (Good level/ Medium level/ Poor), 4. Housing (Good vs. Poor), 5. Transportation (Motorbike vs. No motorbike), 6. Income (610 USD*/ 732 USD/ 854 USD), 7. Training (None/ Workshops/ Visits from Specialist/ Higher Edu)	Training and education
14	Witt, 2017	Canada	1. Type of practice (Inter-professional/ Group/ Solo/ Hospital based), 2. Additional rural training (Provided continuously while working in community/ Provided during first year of work in community/ None offered), 3. Income (500 USD; 450 USD; 400 USD; 350 USD; 300 USD; 250 USD), 4. Hours worked per week (35 h/ 45 h/ 55 h/ 65 h), 5. Spouse finding work (Acceptable/ Some/ Limited), 6. On-call activity (1-in-8/ 1-in-6/ 1-in-5/ 1-in-4/ 1-in-3/ 1-in-2), 7. Community-sponsored incentives (None offered/ During first year/ Provided continuously while working in the community), 8. Housing availability (Adequate/ Limited/ Poor), 9. Clinic technology (No existing e-health technology/ Electronic medical record/ Electronic medical record and tele health facilities), 10. Location (Population 5000–15 000, ≤ 3-hr drive to Winnipeg/ Population 5000–15 000, > 3-hr drive to Winnipeg/ Population < 5000, ≤ 3-hr drive to Winnipeg/ Population < 5000, > 3-hr drive to Winnipeg)	Income

VND= Vietnamese dong; PEN= Peruvian Sol; USh= Ugandan shilling; Rs= Indian rupee; IDR= Indonesia Rupiah; USD= United States Dollar

studies identify the “improving equipment” (22) and “good education facilities for children” (25) to be the most important attributes for respondents (Table 3).

Discussion

4 <http://mjiri.iums.ac.ir>
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This systematic review aimed to investigate which attributes were included in DCE studies and which of them was the most important. In this study, various attributes were identified that affect physicians' willingness to work-

ing in deprived areas. The included studies were done in different countries, which use different financial and non-financial incentives to elicit physician's preferences for working in deprived areas.

Different economic, social and cultural conditions of countries can have a different effect on the physicians' preferences for working in deprived areas. Accordingly, it can be said that the type of motivation is different for physicians from one country to another. For example, in some countries, on the one hand increasing salaries and incomes will have a greater impact on physician's decisions (15, 16, 18, 20, 23, 24, 26), and on the other hand, in other countries, these attributes have less impact on the physician's preferences (21, 25, 28). According to the results, it can be concluded that focusing solely on increasing salaries or incomes without considering other attributes, cannot have long-term effects; because financial incentives are one of the interventions intended to improve the shortage of physicians in deprived areas.

Identification of attributes and their levels is a major step in the DCE. Although there is no precise method for identifying attributes and levels, literature review and qualitative research usually used for this purpose (2, 29). Therefore, the use of any of these methods alone can lead to the identification of various attributes and consequently results in different findings. In general, only a few studies (29%) use both reviews and qualitative methods simultaneous to elicit attributes and attribute-levels (15, 16, 19, 27).

In-service physicians and medical students had different views on the attributes that influenced their preferences for working in deprived areas; of the total (9 studies) that examined in-service physicians, based on the results of 7 studies (67%), increasing salaries and incomes increases the likelihood of their attraction or their retention to deprived areas. Of the total of 7 studies focused on medical students, only 2 studies (29%) reported that salaries increase had an impact on the medical students to attract to deprived areas.

Strengths of the study

The results of this review can provide useful information on which package of attributes, policies should be focused and can be helpful for researchers in conducting a DCE study to provide policy options for attracting and recruiting physicians to deprived areas.

Limitations of the study

Many different factors such as study question, identifying the attributes and levels, the number of the attributes, the levels of attribute and variation in analyzing the data affect the results of DCE studies, so comparing the results of included studies, is not possible directly. Furthermore, because only English language studies included in this review, some relevant studies may be ignored. This study only reviews the studies done with the DCE method and has not investigated studies done with other methods for extracting preferences (such as conjoint analysis).

Conclusion

Financial attributes are not the only significant attributes considered by the physicians for deciding where to practice, but also the other non-financial attributes are important. It is suggested, that based on the economic, social and cultural conditions of each country, a specific incentive package, including a set of financial and non-financial incentives, is developed to attract physicians to the deprived areas.

Acknowledgments

This study has been extracted from Ph.D. thesis of first author, Pejman Hamouzadeh (thesis code: 9021383002), and funded by Tehran University of Medical Sciences.

Conflict of Interests

The authors declare that they have no competing interests.

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