Full title: Candidates from wealthy homes or urban areas are more advantageously positioned to qualify for medical school in Japan.

Short title: Advantageous factors in going to medical school.

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Abstract

Background

Determining the bracket of the economic situation to enroll in a medical school in Japan is an arduous task for medical schools and educational administrations.

Methods and Findings

A nationwide cross-sectional survey was utilized with an original questionnaire to identify factors advantageous for high school students seeking admission in a medical school. We sent a letter and questionnaire to the teachers in charge of career guidance at 1,746 high schools in Japan.

A total of 1,094 responses were obtained. Of them, 66.8% responded affirmatively to the statement, "It is difficult for students in economically disadvantaged families to enroll in medical school," while 42.0% responded affirmatively to: "Some students gave up on going to medical school because they could not afford it, " and 61.9% responded affirmatively that "students living in urban areas are more likely to go on to a medical department."

Conclusions

Many high school teachers in Japan believe that students from wealthy families and those living in urban areas have an advantage in advancing to medical school. Consequently, many high school students give up on going to medical school for financial reasons.

Introduction

It has been ascertained that certain individuals have an advantage in advancing to medical school¹⁾. Reportedly, the reasons for such disparities are related to economic status²⁾, familiar role models³⁾, the impact of immigration⁴⁾, and disparities in the preparation environment for examination⁵⁾.

Alternatively, in some countries, the existence of such disparities has not been clarified. In Japan, the information required by the university to take the examination excludes the economic situation. For this reason, it is difficult for medical schools or an educational administration institution, such as the Ministry of Education, Culture, Sports, Science and Technology (MEXT), to grasp what kind of economic situation is advantageous for those who wishing to proceed to medical school.

As in other countries, there are many applicants seeking admission to a medical school in Japan. The ratio of the number of general entrance examination examinees divided by the capacity is about four times for public schools and about 13 times for private schools. Most academic ability tests, which will be described later, are conducted on the interchangeable timetable for public schools, so one candidate cannot take many of them. Thus, the competitive rates of public schools are lower than those of private schools.

The duration of undergraduate education in Japanese medical schools is six years, and one can take the entrance examination after graduating from high school⁶⁾. There are 82 medical schools nationwide, and the annual enrolment capacity is about 9,000. Approximately 60% of these are public schools, and the rest are private schools. The total tuition fees paid by medical students before graduating from medical school are nearly 3.5 million yen (about 35,000 dollars) at public schools and 20 to 50 million yen (about 200,000 ~500,000 dollars) at private schools. In Japan, parents often bear most of the tuition fees. The scholarship system is available to some students under the "regional quota" that requires recipients to work in a specific area after graduation⁷⁾. However, most scholarships are not enough to cover the cost of a private medical school.

Similar to some countries, a nationally unified academic ability test at the university entrance level has been conducted in Japan. However, it is not specialized for medical schools like the MCAT in the United States. In the entrance examination for Japanese medical schools, an academic ability test is conducted at each school. The main purpose of this test is not to judge

the basic academic ability level or aptitude of the examinee but to rank by the score. Each medical school creates its own relatively difficult exam to distinguish the scores of examinees. Given that the content of the question paper is different for each medical school, examinees who have taken special exam preparations with reference to past exam questions have an advantage. Preparatory schools promote this special examination preparation, and they recommend such schools for medical school entrance exam ensuing school hours or on holidays from the age of 12. Many of these special prep schools are in urban areas. Their tuition fees are higher than that of usual prep schools, about 3 to 6 million yen (about 30,000 to 60,000 dollars) per year.

In addition, many private junior and senior high schools, which are relatively concentrated in urban areas, provide enhanced preparation for entrance exams for medical schools and famous universities, which contributes to the disparity in the educational environment between rural and urban areas at the secondary education stage⁸⁾. Preparations for taking entrance exams for these famous public and private high schools begin from an even younger age. In metropolitan areas, it is common for junior school children and even preschoolers to attend private cram schools.

Given this environment, it is presumed that children from economically blessed families and those living in urban areas are advantageously placed for advancing to a medical school in Japan. However, in the range we prospected, we could not find any reports to support or oppose this theory. This study clarifies some parts of such educational disparities in medical school entrance examinations in Japan.

Methods

This study is a nationwide cross-sectional survey using a questionnaire.

As mentioned above, it is difficult to investigate information on the financial status and place of residence of examinees and enrollees in medical schools in Japan. Instead, this study focused on teachers in charge of career guidance at high schools with a relatively high rate of university advancement. We speculated that they had a detailed understanding of the student's situation.

At the time of the survey, there were 4,925 high schools across Japan. From these, we extracted 1,746 high schools that were listed in two articles on university entrance exams in major

weekly magazines. According to the article, more than one student at the schools on this list advanced to a well-known university or four-year college. We collected the locations of these high schools from publicly available information (mainly from the websites) and sent letters and questionnaires to the teachers in charge of career guidance at each school in June 2015, asking them to cooperate in the survey. In September of the same year, a letter of request and a questionnaire was sent again to high schools that did not respond by August of the same year.

Table 1 shows the main contents of the questionnaire. These were created based on the discussions at the International Symposium⁹⁾ and our research group.

The subjects' responses were aggregated and analyzed by descriptive statistics and a chi-square analysis. Statistical software JMP[®] 12 (SAS Institute Inc., Cary, NC, USA) was used for the analysis. This survey was conducted with approval from the Hokkaido University Ethical Committee, which was later deemed unnecessary as there were no applicable ethical considerations as on 19 June 2015.

Table 1. Main contents of the questionnaire

<ul style="list-style-type: none"> • Respondent attributes
Subject in charge, years of experience as a high school teacher, etc.
<ul style="list-style-type: none"> • Attributes of the high school
The number of students, university admission rate, number of students enrolled at medical schools, tuition fees, etc.
<ul style="list-style-type: none"> • Respondents' recognition of entrance exams for medical schools
Skills/ abilities that are emphasized, the impact of the economic condition of the family, the impact of the student's place of residence, etc.
<ul style="list-style-type: none"> • Attributes of students aspiring to go to medical school
The percentage of parents who are doctors or dentists, etc.

Results

Answers were obtained from 1,094 individuals (from 671 public schools and 423 private schools). The recovery rate was 62.7%.

(1) Number of students

The average number of students enrolled at each high school was 272.7 ± 110.7 (range 20-1,026), with 99 or less at 43 schools (3.9%), 100 to 199 at 237 schools (21.7%), 200 to 299 at

383 schools (35.0%), 300 to 399 students at 319 schools (29.2%), and more than 400 students at 97 schools (8.9%) respectively. Sixteen schools (1.5%) did not answer this question.

(2) University admission rate and number of students enrolled in medical schools

There were 612 high schools (55.9%) with an admission rate of 80% or more to 4-year colleges, and 136 schools (12.4%) with an average of 11 or more graduates enrolled in medical schools. There were 290 schools (26.5%) and 665 schools (60.8%) with 1 to 10 students and 1 or fewer students, respectively.

(3) Tuition fees

Table 2 shows the answers regarding tuition fees for the three years of high school. Only 13 out of 423 private schools cost less than 1 million yen (about \$ 10,000). Among the public schools, only 20 out of 671 answered 1 million yen or more.

Table 2 Total tuition fees for the three years of high school

Amount of tuition*	All schools (n=1094)	Public schools (n=671)	Private schools (n=423)
Less than 500,000 yen (less than about \$ 5,000)	324 (29.6%)	321	3
500,000 yen~990,000 yen (about \$ 500,000~990,000)	210 (19.2)	200	10
1,000,000 yen~1,990,000 yen (about \$ 100,000~199,000)	203 (18.6)	19	184
2,000,000 yen or more (about \$ 200,000 or more)	187 (17.1)	1	186
Do not know or no answer	170 (15.5)	130	40
* Total amount of admission fees, tuition fee, facility equipment fee, and other expenses that need to be paid.			

(4) Impact of economic conditions of the family on advancing to medical school

Seven hundred thirty-one respondents (66.8% of all) responded affirmatively to the statement, "It is difficult for students in economically disadvantaged families to advance to a medical school."

Of the respondents (1,076), 42.0% (448) responded affirmatively to the statement, "Some students gave up on going to medical school because they could not afford it."

Respondents from private schools accounted for 47.5% (201 out of 423) and public schools for 36.8% (247 out of 671). Table 3 shows this ratio examined by eight regional categories in Japan. In the Kanto area, including Tokyo, the capital city, the percentage of "some students gave up" was high at 60.0%. It was relatively low in Hokkaido (20.8%), Chugoku-Shikoku (24.1%), and Tohoku (28.0%), and there was a statistically significant difference from the Kanto area ($\chi^2(7, N = 1,076) = 76.95, p < 0.0001$).

Table 3. Number and percentage of respondents who chose an affirmative response to the statement, "Some students gave up on going to medical school because they could not afford it" Respondents (n=1,076)

Regional category	Total No. of respondents	No. and percentage of affirmative response	
Hokkaido	72	15	20.8%
Tohoku	101	28	28.0
Kanto	305	180	60.0
Hokuriku/Koshinetsu	93	39	42.4
Chubu	112	45	41.3
Kinki	175	66	38.1
Chugoku/Shikoku	110	26	24.1.
Kyushu/Okinawa	126	49	40.2

(5) Impact of the student's place of residence

Six hundred seventy respondents (61.9% of the 1,082) responded affirmatively to, "students living in urban areas are more likely to advance to a medical department."

(6) Number of graduates enrolled at medical schools and location of the high school

Figure 1. Number of students enrolled in medical school by location and type of high school

Figure 1 shows a graph of the 1,091 people who responded regarding the number of graduates enrolled at medical school, divided according to the population size of the municipality where the high school is located and whether it is public or private. The highest percentage of high schools with two or more graduates enrolled at medical school in the average year were private ones in cities with a population of 200,000 or more, 153 of 296 schools (51.7%). Further, the lowest percentage were located in municipalities with a population of less than 200,000—93 out of 347 (26.8%). There were 106 (52 public and 54 private) schools in cities with a population of 200,000 or more, compared to 30 (13 public and 17 private schools) schools in

cities, towns, and villages with less than 200,000 residents, where more than 10 students advanced to a medical school in the average year.

(7) Percentage of parents who are doctors or dentists

Regarding the students aspiring to go to medical school, we asked about the percentage of parents who were doctors or dentists. Out of 1,068 respondents, 390 (36.5%) answered: "I do not know." 257 (24.1%), 166 (15.6%), and 255 (23.9%) answered "9% or less," "10%-49%," and "50% or more" respectively.

Discussion

As is widely recognized, passing the entrance examination of a medical school is the first step toward becoming a medical doctor. In this survey, about two-thirds of the respondents affirmed that it is difficult for underprivileged students to advance to a medical school. It can be seen that individuals from wealthy families are more advantageously placed in this regard.

The percentage of respondents who admitted that some students gave up on going to medical school for financial reasons was particularly high in the Kanto area. Although about 33.5% of the total population of Japan lives in this area, the number of medical schools is rather small at 23 out of 79 (29.1%). Moreover, it may be related to fewer public schools in this area—6 out of 50 (12%). From these results, it can be inferred that a medical school with low tuition fees will help open doors to admission for more people.

Aside from the fact that children from less wealthy families are unable to enroll in private medical schools due to their high tuition fees, it is also challenging to pass the entrance examination for a public medical school without considerable preparation. Attending a prep school specializing in medical school entrance exams or a high school with a high medical school entrance rate can put one in an advantageous position. It can be inferred that in families with economic difficulty, candidates may give up on applying to medical schools. Additionally, even at a public medical school, the annual tuition fee alone is 535,800 yen (about 5,000 dollars), making it daunting for economically disadvantaged families to pay the amount for six years. Since the privatization of national universities has been promoted since 1998, the tuition fees can be further increased at the discretion of the university. Two medical schools have already raised tuition fees. Kobayashi analyzed and reported on the burden of education costs that make it difficult to advance to universities, based on a survey of parents of Japanese high school students. According to the report, when the desired career path was

medical and dental medicine, the proportion of those who wished to pursue this career was significantly lower in the low-income bracket¹⁰). It is presumed that this is related to the relatively long period of required school attendance (as long as six years), if these courses are selected.

More than 60% of the respondents found it easier to advance to a medical school in urban areas. To support this, nearly half the private high schools in cities with a population of 200,000 or more had more than two students enrolled in medical schools in the average year. In contrast, about one in four public high schools located in municipalities with a population of less than 200,000 had an average of two or more students going to medical school each year. For reference, Japan has a population of about 126 million, of which about 67 million (about 53%) live in cities with a population of 200,000 or more. In addition, 44 of the 47 prefectural capitals have a population of more than 200,000.

In our survey, about one in four respondents affirmed that the parents of more than half of the students aiming for medical school were doctors or dentists. Polyakova et al. reported an increasing proportion of parents of medical students in Sweden who are physicians¹¹). Brown called “parentocracy” the social mechanisms and norms in which the achievement of a child's education depends on the parent's interest in education and active support¹²). From this survey, it was not possible to examine in detail the fact that parents who are physicians or dentists affect their children's aspiration for becoming medical doctors, but parentocracy may be prevalent in Japanese medical education.

Why is there a tendency in Japan to emphasize academic achievement tests unique to each medical school? Bourdieu called non-monetary educational background and cultural background “cultural capital.” He said that parents with a rich cultural capital have a favorable effect on the achievement of their children's status¹³). Alternatively, Tachibanaki argued that in Japan, the degree of trust and dependence on “learning capital” is considerably higher than that on cultural capital¹⁴). Learning capital is a concept advocated by Kariya, which states, “learning competencies are the core of human capital”¹⁵). In other words, there might be a tendency in Japan to emphasize an individual's learning efforts and the abilities obtained by them rather than the origin and environment. Many of the entrance exams of famous Japanese universities, not limited to medical schools, seem to decide the pass/fail criteria according to the so-called academic ability rather than setting the criteria for some necessary abilities and measuring them on multiple axes. The sense of value behind this may be the emphasis on learning capital. However, as revealed in this survey, the influence of the financial situation

of the family and the place of residence, and eventually the educational disparity, are increasing in the entrance examinations for medical schools. One of the reasons may be the difficulty of passing the examination of each school without special measures.

In Japan, the birthrate has been declining, and the population is aging at the fastest rate in the world. In 2020, 28.7% of Japan's population, about 126 million, will be aged 65 years or more. The demand for medical care among them is increasing, but the number of young people who can become human resources that support medical care is decreasing. The population that is 18 years old, the age at which they begin entering medical schools, declined from 1.51 million in 2000 to 1.18 million in 2018. We need to maintain or increase the number of trained doctors and the quality of medical care from a small pool of young people. While a person in a particular environment may have an advantage while taking the entrance exam of a medical school, young people who are not blessed so may give up at an early stage. As aforementioned, many countries have similar issues, and it is necessary to consider the policies of these countries' disparity correction policies and their consequences. It is important to open the doors to medical schools while ensuring the evaluation of the academic ability necessary for learning after enrolling in a medical school. It will encourage people with a wider range of talents and backgrounds to apply.

This research has some limitations. First, since it was not targeted at high school students and their parents and was an indirect survey of teachers in charge of career guidance, detailed numerical values and decision-making factors regarding the background of individual high school students could not be measured. Second, the recovery rate was about 60%, which may not fully reflect the overall trend. Third, nearly five years have passed since the survey was conducted, and there is a concern that it does not reflect the latest situation. In addition, this survey was conducted only in Japan, and this result cannot be applied to other countries.

However, this is the first report of a nationwide survey and examination of the impact of the environment, such as the financial situation and place of residence of examinees appearing in entrance examinations for medical schools in Japan. It can be said that it contains important suggestions when considering the future entrance examination system of medical schools and parentocracy in Japan and other countries.

In conclusion, this survey revealed that many high school teachers in charge of career guidance believe that students from wealthy families and those living in urban areas have an advantage in advancing to medical school. It was also revealed that many high school students gave up on going to medical school for financial reasons. Future research should examine the impact

of this situation on medical education and the medical system and outline steps to resolve the problems.

COI

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Authors' contributions

JO and SNK made the outline of this survey. The four authors (JO, KT, MS, YW) discussed, edited and piloted the questionnaire. JO and KT analyzed the primary data and discussed the results with YH, HM and other researchers. JO wrote the draft of manuscript and all authors read, discussed and approved the final manuscript.

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