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Original Article

The current dental school admissions: An overview of the admission process and the geographical distribution of dental school enrollees in Taiwan

Feng-Chou Cheng ^{a,b†}, Ming-Chung Lee ^{a†}, Ling-Hsia Wang ^c,
Wen-Juain Lin ^d, Tsui-Hua Liu ^{a,e}, Shiang-Yao Liu ^{a,f**},
Chun-Pin Chiang ^{g,h,i*}



^a School of Life Science, National Taiwan Normal University, Taipei, Taiwan

^b Science Education Center, National Taiwan Normal University, Taipei, Taiwan

^c Center for the Literature and Art, Hsin Sheng Junior College of Medical Care and Management, Taoyuan, Taiwan

^d Taipei First Girls High School, Taipei, Taiwan

^e Taipei Municipal Jianguo High School, Taipei, Taiwan

^f Graduate Institute of Science Education, College of Science, National Taiwan Normal University, Taipei, Taiwan

^g Department of Dentistry, National Taiwan University Hospital, College of Medicine, National Taiwan University, Taipei, Taiwan

^h Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan

ⁱ Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Hualien, Taiwan

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Abstract *Background/purpose:* There is no specific admission system for dentistry in Taiwan. The aims of this study were to describe and analyze the current admission processes for entry into dental schools through the university admission system and to compare the geographical distribution of dental school enrollees.

Materials and methods: All seven dental schools of general universities in Taiwan were included to analyze the admission protocols in 2019 and 2020. All data of dental enrollment

* Corresponding author. Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, No. 707, Section 3, Chung-Yang Road, Hualien, 970, Taiwan.

** Corresponding author. Graduate Institute of Science Education, College of Science, National Taiwan Normal University, No. 88, Sec. 4, Ting-Chou Road, Taipei, 11677, Taiwan.

E-mail addresses: liusy@ntnu.edu.tw (S.-Y. Liu), cpchiang@ntu.edu.tw (C.-P. Chiang).

† These two authors contributed equally to this work.

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Dental school enrollees;
Equality of admission opportunities

quotas and dental school enrollees presented in this study were collected from information available to the public on the related websites.

Results: The total dental enrollment quotas via the university admission system were 381 in 2019 and 397 in 2020. Those admitted via the special program for indigenous peoples and offshore island peoples were both 27 in 2019 and 2020, respectively. The main dental school admission way was individual application, and the main providers of dental enrollment quotas were northern dental schools and private dental schools. In addition, dental school enrollees were concentrated in the northern region, municipalities, and cities in Taiwan.

Conclusion: Further advancement is needed to expand participation and broaden the sociodemographic profile of dental school applicants. The dental schools would benefit from a long-term prospective study about the correlation of admission methods with students' performance in dental schools. The special program is impacting the equality of admission opportunities. It is necessary to track the practice dynamics of these dental school graduates who were enrolled via the special program as a basis for policy adjustment.

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Introduction

Admission into dental schools is a competitive and multi-faceted process designed to select students who are capable of completing the degree of Doctor of Dental Surgery (DDS) and also possess the attributes to become a full contributing member of the profession.¹ Dentistry has been taught in Taiwan's universities for more than 100 years since 1918, when a separate subject of dentistry first appeared in Taiwan Government Medical School.^{2,3} Throughout this long period, the various application processes have evolved in Taiwan's university admission system, shifting from a single-exam admission system to a multiple-admission system. Although about 400 individuals succeed in obtaining a dental student quota annually and the number of dental graduates is growing year by year, it is still an increasingly desirable degree, especially since Taiwan implemented the National Health Insurance (NHI) in 1995.^{4–6} Currently, there are 8 universities with dental schools in Taiwan, one of which is affiliated to a military university.

Dental schools in Taiwan only have a six-year DDS degree dental education system, and most potential applicants are 17- to 18-year-old graduates from senior high school. In the past, it has been noted internationally that disadvantaged groups (minorities, low socioeconomic status families, rural residents, etc.) have access barriers for dental or medical education such as unfair admission, a disadvantageous position for application, and high tuition and fees.^{1,7} Our studies have also noticed that Taiwan's university admission system is not conducive to disadvantaged students' access to dental schools. Due to the multi-faceted competition process, they even have no chance to participate in the competition. We have also confirmed that there is a clear urban-rural gap in the admission of students to dental schools in Taiwan. The dental school enrollees are almost entirely the senior high school graduates from the metropolitan areas, and only a small number of students are from the remote villages of Taiwan.^{4–6} In the educational scene of the dental school, we also found that the vast majority of

dental students come from families with high socioeconomic status.⁸ The above phenomena may become serious to result in the concentration of dental education resources in higher social classes, and worsen the urban-rural gap and uneven distribution of medical resources.^{4–6}

In the UK, strategies and models to widen access have been suggested for medicine and dentistry to widen the sociodemographic aspect of their students.^{9,10} Most universities' official position is to support wider participation by being flexible with academic requirements for those who are from a lower socioeconomic background.¹ In Taiwan, the university admission system has also begun to provide guaranteed quotas for dental school admission for students from offshore islands or low-income families.

The aims of this study were to describe and analyze the current admission processes for entry into dental schools through the university admission system. The geographical distribution of the selected dental school enrollees was also analyzed to give an indication of the future profession's geographical layout.

Materials and methods

This study used the documentary analysis to find the applicant selection process adopted by Taiwan's dental schools and the secondary data analysis to collect the information about the dental enrollment quotas offered by the seven dental schools or departments of dentistry from 7 general universities via university admission system and the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples in Taiwan in 2019 and 2020. This information was open to access and could be collected from the related websites.

In addition, we also obtained the information of enrolled dental freshmen (dental school enrollees) in 2019 and 2020 from the website of the Joint Board of College Recruitment Commission. This information included the admission ways, the dental schools and examination areas of enrolled dental freshmen. There are three admission ways for dental freshmen, including the examination admission, numerous

stars initiatives admission, and individual application admission. Furthermore, there are 7 dental schools or departments of dentistry in Taiwan, including National Taiwan University, National Yang Ming Chiao Tung University, and Taipei Medical University in Taipei City; China Medical University and Chung Shan Medical University in Taichung City; National Cheng Kung University in Tainan City; and Kaohsiung Medical University in Kaohsiung City. According to the locations of the examination rooms in different examination areas of Taiwan, we could find the locations of the cities or counties where enrolled dental freshmen came from.

The dental schools of Taiwan could be divided into three groups according to their locations: northern, central, and southern dental schools. The whole area of Taiwan was divided into five regions: northern, central, southern, and eastern regions, and offshore islands. The northern region included Taipei City, New Taipei City, Keelung City, Taoyuan City, Hsinchu City, and Hsinchu County. The central region included Miaoli County, Taichung City, Changhua County, Nantou County, and Yunlin County. The southern region included Chiayi City, Chiayi County, Tainan City, Kaohsiung City, and Pingtung County. The eastern region included Yilan County, Hualien County, and Taitung County. Moreover, the offshore islands included Penghu County, Kinmen County, and Lienchiang County. In addition, the whole area of Taiwan could also be divided into two groups: municipalities and non-municipalities. Moreover, it could also be divided into two groups: cities and counties. All data obtained from the related websites were stored in excel files and used for descriptive statistics.

Results

In Taiwan, there is no specific admission test for admission to dental school or medical school. Moreover, seven dental schools or departments of dentistry of general universities participate in the university admission system of the Joint Board of College Recruitment Commission and another special admission system of the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples for enrolling their dental students.

Admission tests and applicant selection process

There are three admission tests, the General Scholastic Ability Test (GSAT), Advanced Subjects Test (AST), and Test of English Listening Comprehension (TELC), which are required in Taiwan's university admission system. Three different channels of university admission include: numerous stars initiatives admission, individual application admission, and examination admission.

Students who wanted to gain admission to a dental school needed to take certain admission tests. All dental schools required minimum academic standards of GSAT for numerous stars initiatives admission and individual application admission. Some dental schools also required minimum academic standards of TELC. In numerous star initiatives admission, senior high schools recommended their fresh graduates who met the recommendation conditions of each dental school and studied in the same high

school throughout the whole process to dental schools. The qualified students needed to take the GSAT and then applied to dental schools for admission. Before 2019, all dental schools combined students' academic achievement at senior high school together with the GSAT score for final determination of which candidates could obtain a dental school admission permission. However, after 2020, all dental schools ranked their applicants using a point system that also combined students' academic achievement together with the GSAT score for final determination of which candidates could be interviewed and potentially be given a dental school admission permission. In individual application admission, students applied to the dental schools based on their personal interests. Moreover, all dental schools ranked their applicants according to their GSAT score for determination of which candidates could take the dental school screening that might include academic achievement at the senior high school, interview, short essay, skill examination (drawing and engraving), and subject examination and potentially be given a dental school admission offer. In addition, the community experience and personal statement and references were considered as additional aspects. In examination admission, students needed to take the AST first, and the admission of dental schools were determined according to the students' volunteers and test scores, similar to the previous joint college entrance examination.

In the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples, all qualified students needed to take the GSAT first, and then applied to the program for admission to dental schools. The program also required minimum academic standards of GSAT score. As long as the students who met the standard could be interviewed by examination organizer and potentially be given a dental school admission offer. Students might participate in more than 2 admission processes, but through the distribution of the system, they could only obtain admission to at most one dental school in the end.

Dental enrollment quotas for Taiwan's dental schools in 2019 and 2020

In Taiwan, the enrollment quotas of all universities must be approved by the Ministry of Education, including the dental school enrollment quotas. The medical and dental enrollment quotas must comply with the Ministry of Health and Welfare's principle for controlling the overall number of medical personnel. The dental school enrollment quotas provided for disadvantaged students such as students from offshore islands or low-income families in individual application admission of university admission system and all quotas in the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples are both additional ones.

The dental enrollment quotas via the university admission system in 2019 and 2020 are shown in [Table 1](#). The general and additional dental enrollment quotas were 381 in 2019 and 397 in 2020. Among the three admission ways, individual application admission had the highest dental enrollment quotas (184 in 2019 and 218 in 2020), followed in a descending order by examination admission (166 in

Table 1 The dental enrollment quotas via the university admission system approved by the Ministry of Education in 2019 and 2020.

Year	2019		2020		
	General dental enrollment quotas	Additional quotas A	General dental enrollment quotas	Additional quotas A	Additional quotas B
Admission ways					
Numerous stars initiatives	31	—	40	—	—
Individual application	171	13	204	10	4
Examination	166	—	139	—	—
School locations					
Northern dental schools	145	6	146	6	3
Central dental schools	122	4	138	3	0
Southern dental schools	101	3	99	1	1
Public or private					
Public dental schools	82	6	85	5	2
Private dental schools	286	7	298	5	2
Total	368	13	383	10	4

The additional quotas A were dental enrollment quotas for students from offshore islands, and the additional quotas B were dental enrollment quotas for other disadvantaged students from low-income families or with disabilities.

2019 and 139 in 2020) and numerous stars initiatives admission (31 in 2019 and 40 in 2020) (Table 1). Based on school locations, northern dental schools had the highest dental enrollment quotas (151 in 2019 and 155 in 2020), followed in a descending order by central dental schools (126 in 2019 and 141 in 2020) and southern dental schools (104 in 2019 and 101 in 2020). In addition, private dental schools had the highest dental enrollment quotas (293 in 2019 and 305 in 2020), followed by public dental schools (88 in 2019 and 92 in 2020) (Table 1). Furthermore, in individual application admission, there were 13 and 10 additional dental enrollment quotas offered for students from offshore islands in 2019 and 2020, respectively. Moreover, there were 4 additional dental enrollment quotas offered

for other disadvantaged students from low-income families or with disabilities for the first time in 2020 (Table 1).

On the other hand, the dental enrollment quotas and the number of dental school enrollees via the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples in 2019 and 2020 are shown in Table 2. In this special program, the total dental enrollment quotas were both 27 in 2019 and 2020, respectively. There were 18 and 17 dental enrollment quotas offered for indigenous peoples in 2019 and 2020, respectively. Moreover, there were 9 and 10 dental enrollment quotas offered for students from offshore islands in 2019 and 2020, respectively (Table 2). In addition, private dental schools had the highest dental enrollment quotas (both 20 in 2019 and 2020, respectively),

Table 2 The dental enrollment quotas and the number of dental school enrollees via the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples in 2019 and 2020.

Year	2019		2020	
	Dental enrollment quotas	Number of dental school enrollees	Dental enrollment quotas	Number of dental school enrollees
Category				
Indigenous peoples	18	18	17	17
Offshore island residents	9	8	10	9
Penghu county	2	2	3	3
Kinmen county	2	2	2	2
Lienchiang county	2	2	2	2
Liuqiu township	1	1	1	1
Green island township	1	1	1	1
Lanyu township	1	0	1	0
Public or private				
Public dental schools	7	7	7	7
Private dental schools	20	19	20	19
Total	27	26	27	26

followed by public dental schools (both 7 in 2019 and 2020, respectively) (Table 2).

Numbers of dental school enrollees in 2019 and 2020

The numbers of dental school enrollees via the university admission system in 2019 and 2020 are shown in Table 3. The general and additional dental school enrollees were 395 in 2019 and 386 in 2020. Among the three admission ways, individual application admission had the highest number of dental school enrollees (183 in 2019 and 199 in 2020), followed in a descending order by examination admission (174 in 2019 and 146 in 2020) and numerous stars initiatives admission (38 in 2019 and 41 in 2020) (Table 3). Based on dental school locations, northern dental schools had the highest number of dental school enrollees (161 in 2019 and 154 in 2020), followed in a descending order by central dental schools (both 128 in 2019 and 2020, respectively) and southern dental schools (106 in 2019 and 104 in 2020). In addition, private dental schools had the highest number of dental school enrollees (300 in 2019 and 295 in 2020), followed by public dental schools (95 in 2019 and 91 in 2020) (Table 3). Furthermore, in individual application admission, there were 12 and 6 additional dental school enrollees offered for students from offshore islands in 2019 and 2020, respectively. Moreover, there were 4 additional dental school enrollees offered for other disadvantaged students from low-income families or with disabilities for the first time in 2020 (Table 3). These results indicate that numerous stars initiatives admission usually had extra dental enrollment quotas, while individual application admission usually had unfilled vacancies of dental enrollment quotas. Moreover, these unfilled vacancies would eventually be filled by dental school enrollees from examination admission, and would usually exceed the originally scheduled total dental enrollment quotas. On the other hand, in the Medical Personnel Training Program for Indigenous Peoples and Offshore Island Peoples in 2019 and

2020, only the dental enrollment quotas of Lanyu township did not admit dental students. All others were admitted in full (Table 2).

Distributions of dental school enrollees via the university admission system in 2019 and 2020

The distributions of dental school enrollees via the university admission system in 2019 and 2020 are shown in Table 4. Based on student locations, northern region had the highest number of dental school enrollees (180 in 2019 and 172 in 2020), followed in a descending order by southern region (99 in 2019 and 106 in 2020), central region (both 95 in 2019 and 2020, respectively), offshore islands (11 in 2019 and 7 in 2020), and eastern region (10 in 2019 and 6 in 2020). According to municipality or not, municipalities had the highest number of dental school enrollees (297 in 2019 and 307 in 2020), followed by non-municipalities (98 in 2019 and 79 in 2020). According to city or county, cities had the highest number of dental school enrollees (331 in 2019 and 344 in 2020), followed by counties (64 in 2019 and 42 in 2020) (Table 4). These results indicate that dental school enrollees are concentrated in the northern region, municipalities, and cities.

Discussion

In fact, Taiwan does not have a specific admission system for medicine and dentistry. However, Taiwan's dental school admission system is quite complicated. It is attached to the three channels of the university admission system, and there are several special admission programs which offer additional dental enrollment quotas for indigenous peoples, students from offshore islands, and students from low-income families or with disabilities.⁴ However, the dental school admission system of the military university and the transfer programs in dental schools associated with universities are not included in this study.

Table 3 The number of dental school enrollees via the university admission system in 2019 and 2020.

Year	2019		2020		
	General dental school enrollees	Additional enrollees A	General dental school enrollees	Additional enrollees A	Additional enrollees B
Admission ways					
Numerous stars initiatives	38	—	41	—	—
Individual application	171	12	189	6	4
Examination	174	—	146	—	—
School locations					
Northern dental schools	155	6	149	2	3
Central dental schools	125	3	125	3	0
Southern dental schools	103	3	102	1	1
Public or private					
Public dental schools	92	3	87	2	2
Private dental schools	291	9	289	4	2
Total	383	12	376	6	4

The additional enrollees A were dental school enrollees for students from offshore islands, and the additional enrollees B were dental school enrollees for other disadvantaged students from low-income families or with disabilities.

Table 4 Distributions of dental school enrollees via the university admission system in 2019 and 2020.

Year	2019		2020		
	General dental school enrollees	Additional enrollees A	General dental school enrollees	Additional enrollees A	Additional enrollees B
Student locations					
Northern region	180	0	171	0	1
Central region	95	0	94	0	1
Southern region	98	1	104	0	2
Eastern region	10	0	6	0	0
Offshore islands	0	11	1	6	0
Municipality or not					
Municipalities	297	0	303	0	4
Non-municipalities	86	12	73	6	0
City or county					
Cities	331	0	340	0	4
Counties	52	12	36	6	0
Total	383	12	376	6	4

The additional enrollees A were dental school enrollees for students from offshore islands, and the additional enrollees B were dental school enrollees for other disadvantaged students from low-income families or with disabilities.

From the history of dental school admission in Taiwan, the Department of Dentistry of National Taiwan University (NTU) was established in 1953. For the first time, the Department of Dentistry participated in NTU's own examination admission system. At that time, 10 students applied for the Department of Dentistry, but no one was admitted. In 1954, Taiwan's joint college entrance examination for admission of colleges and universities was implemented, and the Department of Dentistry of NTU also participated in the joint admission system. Moreover, it was the only way that students were admitted. However, NTU's first dental graduates were enrolled in 1955.

Since Taiwan's dental schools have been involved the university admission system for nearly 70 years, dentistry has become a popular choice for high school students to major in university, and there is a competitive and multi-faceted process for admission to dental schools.^{4–6} The number of dental schools has increased from one dental school to 7 dental schools. The admission policy has changed from single joint college entrance examination to multi-tracks program of recruitment for universities. The admission examination method has developed from the subject-only examination method to the multi-examination selection method. The number of applicants has grown from only 10 applicants for the first time to currently tens of thousands of potential candidates every year. The number of dental school enrollees has grown from no one admitted for the first time to currently more than 400 dental school enrollees every year. In addition, the admission system has evolved from not caring about the admission of disadvantaged students to providing several guaranteed quotas for disadvantaged students. These all show that our dental school admission system is evolving.

In addition to the implementation of NHI in Taiwan in 1995, under the rapid development of high-cost treatment items of dentistry such as orthodontics, dental implants, and prosthodontics in the past 20 years, dentists have long become a kind of medical personnel with high income and

high quality of life. As a result, admission to dental school has become a popular choice for our senior high school graduates' career planning.⁴ Therefore, the difficulty and competitive pressure of getting an admission to a dental school has been on the rise, and it is even more difficult than getting an admission to a medical school.

In the past, the university admission system has also begun to pay attention to the protection of educational opportunities for disadvantaged peoples. Like numerous star initiatives admission, its purpose is to help disadvantaged students, balance the gap between urban and rural areas, and allow students with weaker socioeconomic status to have the opportunity to enter high-quality universities. However, our previous study found that numerous stars initiatives admission may benefit students in senior high schools of various metropolitan areas, but not necessarily students in senior high schools of remote areas in Taiwan.⁴ This study had the similar findings, in addition to being predominantly concentrated in the northern region, dental school enrollees were extremely concentrated in municipalities or cities in Taiwan. Only one general dental school enrollee from offshore islands appeared in 2020 (Table 4). For the first time of the four additional dental enrollment quotas for disadvantaged students from low-income families or with disabilities in 2020, the dental school enrollees were all from municipalities (Table 4). This finding indicates that even the disadvantaged groups in the metropolitan areas are more competitive in education among the disadvantaged groups. Therefore, it seems that the guaranteed admission policy does not take care of the "real" disadvantaged groups in remote areas of Taiwan. Furthermore, due to the special programs for additional quotas, the dental school enrollees are growing year by year.

It is a long-standing fact that dental school enrollees are concentrated in students from high socioeconomic status families and metropolitan areas internationally, and this is also the case in Taiwan. Up to date, in addition to students from offshore islands and those from low-income families,

there are new programs of dental enrollment quotas for those from families with special circumstances, those who are children of new immigrants, and those from the remote high schools in Taiwan. Although the special medical and dental enrollment program for indigenous peoples and offshore island students was implemented as early as 1969, and the government stated that 70% of the medical personnel who passed this program stayed in their hometowns to serve, the evidence shows that the urban-rural gap and regional imbalance in Taiwan's medical resources are still deteriorating or not improving.^{11–14} Therefore, we believe that the admission policy should be made to encourage medical personnel who are willing to serve in offshore islands or the remote areas of Taiwan, regardless of whether they originally come from those areas. In addition, creating too many additional dental enrollment quotas for students from offshore islands may not be effective to recruit dental personnel. If they do not return to their hometowns to serve after they become dentists, not only will it not solve the problem of lack of dental resources in offshore islands, but it will worsen the urban-rural gap and regional imbalance in Taiwan's dental resources.⁴ Although the government can ask the students to sign contracts that require the students enrolled in dental schools through the special programs to return to their hometowns to serve for a period of time after they graduate and become dentists, that is only a temporary restriction for the contractors. Therefore, how to screen out students with a passion for returning to their hometowns to serve or caring the disadvantaged groups is the key to solve this difficult problem.

On the other hand, excessive admission protection creates another problem of unequal admission opportunities.⁴ In 2020, Taiwan's total population are 23,561,236, all indigenous peoples are 576,785, and all offshore island peoples are 281,224. There are 383 dental enrollment quotas for general students, 17 quotas for those who are indigenous peoples, and 20 quotas for those from offshore islands. The ratios of dental enrollment quotas to 100,000 people are 1.63 among the total population, 2.95 among indigenous peoples, and 7.11 among offshore island peoples. This finding indicates that the dental enrollment quotas allocated per 100,000 peoples in the group of indigenous peoples and the group of offshore island peoples are 1.81 folds and 4.36 folds compared to the group of the total population, respectively. On the contrary, the dental school admission opportunities for students of special ethnic groups are much higher than those for students of general population.

This article highlights the university admission system and the special program for indigenous peoples and offshore island peoples adopted by dental schools within Taiwan in selecting applicants to their respective DDS courses as well as the geographical distribution of dental school enrollees. Nevertheless, in addition to students from offshore islands and those who are indigenous peoples, the final entrants selected as dental undergraduate students are mostly concentrated in the northern region and extremely concentrated in municipalities or cities. Furthermore, most dental enrollment quotas are provided by private dental schools.

Based on the findings in this study, the conclusions can be drawn as follows. First, further advancement is needed to expand participation and broaden the sociodemographic profile of dental applicants, especially for disadvantaged students from the remote areas of Taiwan and those from low-income families or with disabilities. Second, the dental schools would benefit from a long-term prospective study about the correlation of admission methods with students' performance in dental schools. Third, the special program is impacting the equality of admission opportunities. Although the full extent of influence has not yet determined, it is necessary to track the practice dynamics of these special enrollment dental students after they graduate and become dentists as a basis for policy adjustment.

It is also reassuring that dental schools are driving diversity in applicants by introducing a wider participation and alterations to the application process. However, the current dental school enrollment strategy may affect the future dental workforce structure. In fact, it is not difficult to select outstanding students to enter dental schools, but it is still a problem about how to select those who have the characteristics suitable for the dentistry profession and the passion for service in the remote area or caring the disadvantaged peoples. Moreover, it is especially unequal that disadvantaged students have guaranteed dental admission opportunities.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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