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Tuition and fees for medical education and dental education in Taiwan from 1993 to 2021



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Abstract *Background/purpose:* In traditional Taiwan's society, attending medical school or dental school is usually the greatest aspiration of our students. This study tried to explore the evolution of the tuition and fees for medical education and dental education in Taiwan from 1993 to 2021.

Materials and methods: This study used the secondary data analysis to survey the changes in the actual amount of the tuition and fees from 1993 to 2021, and the association of tuition and fees with economic indicators.

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Results: The one-year tuition and fees for medical education increased from 39,020 to 95,200 NT dollars in 1993 to 78,327 and 135,829 NT dollars in 2021 for public and private medical schools, respectively. On the other hand, the one-year tuition and fees for dental education increased from 35,700 to 87,100 NT dollars in 1993 to 71,607 and 130,682 NT dollars in 2021 for public and private dental schools, respectively. Because different increase rates between public and private schools, the gap between tuition and fees per gross domestic product per capita (capita GDP) and those per basic annual salary of labor for public and private schools was shortened year by year.

Conclusion: In addition to allowing reasonable increases of tuition and fees, the government should also consider to let the disadvantaged students pay less tuition and fees, assist disadvantaged students through school loans, school grants or scholarships, and improve the opportunities for disadvantaged students to enroll in medical and dental schools through the admission system.

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Introduction

One of the important purposes of education is to promote social mobility, hoping to break the rigidity of classes by letting people with low-socioeconomic status to receive higher education; so that hard-working people can improve their lives through education and achieve self-realization. Therefore, the education has always been regarded as a promoter for social justice and equity.¹ Educational achievement is the most important factor affecting socioeconomic status, but tuition and fees themselves are the force and purpose of class separation and class reproduction, making higher education an advantage for the rich and a disadvantage for the poor.²

Before 1998, the standard of tuition and fees for universities in Taiwan was set by the Ministry of Education. There were seven categories of public and private medical schools, dental schools, medical colleges (except medical and dental schools), engineering colleges, science and agriculture colleges, business colleges, and art and law colleges. The government allocated funds to subsidize public and private universities, and the increase in tuition and fees of the university was uniformly regulated by the government. Since 1999, the “Flexible Tuition and Fees Adjustment Plan” has been implemented, and each university has set its own tuition and fees standard. Since then, Taiwan’s universities and colleges have some autonomy in the charge of their tuition and fees. However, due to the intervention of government policy, the increase rate has not reached to a significant level.¹ The amount of tuition and fees of various departments of each university is still fixed according to the above seven categories. Among the same type of departments, the tuition and fees of private universities are always higher than those of public universities, because they receive less government subsidies. Among the various departments, the medical and dental schools have the highest tuition and fees, because these two schools have the highest educational costs for each student.

In fact, the first institution of tertiary education in Taiwan was the Taiwan Government Medical School established in 1899.³ After more than a century of development, in traditional Taiwan’s society, attending medical school or dental school is usually the greatest aspiration of our students, and it is also the best channel of social mobility for students with low socioeconomic status, especially after the implementation of National Health Insurance in Taiwan in 1995.^{4,5}

This study attempted to use the secondary data analysis to explore the evolution of the tuition and fees for medical education and dental education in Taiwan, the changes in the actual amount of the tuition and fees in the past 28 years, and the association of tuition and fees with economic indicators. We hope that the results of this study can be served as a consideration for the government’s tuition policy formulation and a reference for tuition and fees-related academic researches.

Materials and methods

This study adopted the methods of the secondary data analysis. The data of the tuition and fees for medical education and dental education in Taiwan were obtained from the website of the Ministry of Education. The information about the tuition and fees for tertiary education announced on the website of the Ministry of Education can be traced from 1993 to 2021. Therefore, we examined the changes of the tuition and fees for medical education and dental education in Taiwan from 1993 to 2021.

In addition, the economic indicator - gross domestic product per capita (capita GDP) for the corresponding years were obtained from the website of the Directorate-General of Budget, Accounting and Statistics. The government-mandated minimum basic monthly salary of labor for the corresponding years were also obtained from the website of the Ministry of Labor. With the data collected above, we calculated the tuition and fees per capita GDP as well as the tuition and fees per basic annual salary of labor

for public and private medical and dental schools, and analyzed their changes from 1993 to 2021.

Results

The number of medical and dental schools and the standard of the tuition and fees for medical education and dental education

In addition to one medical school and one dental school in the military university system, there were 9 medical schools and 6 dental schools in Taiwan in 1993. It should be noted that in Taiwan all dental schools only exist in universities that also have medical schools. There were 3 medical schools and one dental school newly established in 2000, 2009, 2010 and 2019, respectively. Therefore, there

are currently 12 medical schools and 7 dental schools in Taiwan's general university system (Table 1).

Before 1998, the standard of the tuition and fees for tertiary education was uniformly regulated by the Ministry of Education. The Ministry of Education announced the amount of tuition and the amount of fees of public and private medical and dental schools for a semester. We calculated one-year tuition and fees for medical education and dental education based on this information (Table 1). After 1999, the standard of the tuition and fees was set by each university according to the school philosophy, appraisal performance, and educational costs of actual recurring operations. The Ministry of Education announced the total amount of one-semester tuition and fees set by each university. We calculated the average one-year tuition and fees for medical education and dental education based on the tuition and fees of each school (Table 1). Moreover,

Table 1 One-year tuition and fees for medical education and dental education of each student in Taiwan from 1993 to 2021.

Year	Economic indicators		Tuition and fees for medical education		Tuition and fees for dental education		Number of medical (dental) schools		
	Capita GDP	Basic annual salary of labor	Public	Private	Public	Private	Public	Private	Total
1993	296,672	160,200	39,020	95,200	35,700	87,100	3 (2)	6 (4)	9 (6)
1994	321,502	168,120	39,020	95,200	35,700	87,100	3 (2)	6 (4)	9 (6)
1995	347,526	178,560	43,620	117,760	39,920	107,740	3 (2)	6 (4)	9 (6)
1996	374,569	184,320	48,480	121,200	44,360	110,900	3 (2)	6 (4)	9 (6)
1997	402,380	190,080	53,320	121,200	48,780	110,900	3 (2)	6 (4)	9 (6)
1998	428,946	190,080	59,180	127,840	54,120	116,980	3 (2)	6 (4)	9 (6)
1999	445,447	190,080	61,153	122,021	58,320	116,840	3 (2)	6 (4)	9 (6)
2000	465,574	190,080	67,253	129,166	64,140	122,675	3 (2)	7 (4)	10 (6)
2001	452,951	190,080	70,607	128,805	67,330	122,675	3 (2)	7 (4)	10 (6)
2002	473,260	190,080	73,160	128,805	70,030	122,675	3 (2)	7 (4)	10 (6)
2003	484,164	190,080	74,613	128,805	71,020	122,675	3 (2)	7 (4)	10 (6)
2004	512,047	190,080	78,327	133,267	74,550	127,269	3 (2)	7 (4)	10 (6)
2005	529,556	190,080	78,327	134,224	74,550	128,799	3 (2)	7 (4)	10 (6)
2006	550,863	190,080	78,327	134,617	74,550	128,799	3 (2)	7 (4)	10 (6)
2007	583,133	207,360	78,327	134,617	74,550	128,799	3 (2)	7 (4)	10 (6)
2008	570,279	207,360	78,327	136,978	74,550	130,682	3 (2)	7 (4)	10 (6)
2009	559,807	207,360	78,327	134,683	74,550	130,682	3 (2)	8 (4)	11 (6)
2010	607,596	207,360	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2011	614,922	214,560	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2012	630,749	225,360	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2013	654,142	228,564	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2014	694,680	231,276	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2015	726,895	240,096	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2016	746,526	240,096	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2017	763,445	252,108	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2018	779,260	264,000	78,327	135,829	74,550	130,682	3 (2)	9 (4)	12 (6)
2019	801,348	277,200	78,327	135,829	71,607	130,682	3 (3)	9 (4)	12 (7)
2020	839,558	285,600	78,327	135,829	71,607	130,682	3 (3)	9 (4)	12 (7)
2021	924,619	288,000	78,327	135,829	71,607	130,682	3 (3)	9 (4)	12 (7)
Total increase	627,947	127,800	39,307	40,629	35,907	43,582	—	—	—
Mean annual increase	22,427	4564	1404	1451	1282	1557	—	—	—
Total increase rate (%)	211.66	79.78	100.74	42.68	100.58	50.04	—	—	—
Mean annual increase rate (%)	7.56	2.85	3.60	1.52	3.59	1.79	—	—	—

Capita GDP = Gross domestic product per capita.

the maximum and minimum semester tuition and fees from 1999 to 2021 are shown in Table 2. From 1999 to 2021, regardless of medical education or dental education, the minimum tuition and fees for private schools were still higher than the maximum tuition and fees for public schools (Table 2).

The changes of one-year tuition and fees for medical education and dental education of each student in Taiwan from 1993 to 2021

In Taiwan, the capita GDP increased from 296,672 NT dollars in 1993 to 924,619 NT dollars in 2021 (Table 1). The total amount of increase was 627,947 NT dollars from 1993 to 2021 with a mean annual increment of 22,427 NT dollars, and the total increase rate was 211.66% from 1993 to 2021 with a mean annual increase rate of 7.56%. Meanwhile, the basic annual salary of labor increased from 160,200 NT dollars in 1993 to 288,000 NT dollars in 2021. The total amount of increase was 127,800 NT dollars from 1993 to 2021 with a mean annual increment of 4564 NT dollars, and the total increase rate was 79.78% from 1993 to 2021 with a mean annual increase rate of 2.85% (Table 1).

With the growth of economy and the increase of national income, the tuition and fees for tertiary education also increased. The tuition and fees for medical education increased from 39,020 to 95,200 NT dollars in 1993 to 78,327 and 135,829 NT dollars in 2021 for public and private medical schools, respectively (Fig. 1). For public medical schools, the total amount of increase was 39,307 NT dollars from 1993 to 2021 with a mean annual increment of 1404 NT dollars, and the total increase rate was 100.74% from 1993 to 2021 with a mean annual increase rate of 3.60%. For private medical schools, the total amount of increase was 40,629 NT dollars from 1993 to 2021 with a mean annual increment of 1451 NT dollars, and the total increase rate was 42.68% from 1993 to 2021 with a mean annual increase rate of 1.52% (Table 1).

On the other hand, the tuition and fees for dental education increased from 35,700 to 87,100 NT dollars in 1993 to 71,607 and 130,682 NT dollars in 2021 for public and private dental schools, respectively (Fig. 1). For public dental schools, the total amount of increase was 35,907 NT dollars from 1993 to 2021 with a mean annual increment of 1282 NT dollars, and the total increase rate was 100.58% from 1993 to 2021 with a mean annual increase rate of 3.59%. For private dental schools, the total amount of increase was

Table 2 Maximum and minimum semester tuition and fees for medical education and dental education of each student in Taiwan from 1999 to 2021.

Year	Tuition and fees for medical education				Tuition and fees for dental education			
	Public		Private		Public		Private	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
1999	30,790	30,170	63,920	54,054	28,150	27,590	58,490	58,210
2000	33,860	33,180	67,120	57,140	30,960	30,340	61,410	61,120
2001	35,540	34,830	67,110	56,216	32,500	31,840	61,410	61,120
2002	36,590	36,560	67,110	56,216	33,470	33,420	61,410	61,120
2003	37,680	36,560	67,110	56,216	34,460	33,420	61,410	61,120
2004	39,560	38,380	70,460	58,460	36,170	35,080	64,481	61,410
2005	39,560	38,380	70,460	58,460	36,170	35,080	64,481	64,176
2006	39,560	38,380	70,460	58,460	36,170	35,080	64,481	64,176
2007	39,560	38,380	70,460	58,460	36,170	35,080	64,481	64,176
2008	39,560	38,380	72,505	59,317	36,170	35,080	65,425	65,115
2009	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2010	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2011	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2012	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2013	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2014	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2015	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2016	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2017	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2018	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2019	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2020	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
2021	39,560	38,380	72,500	59,317	36,170	35,080	65,425	65,115
Total increase	8770	8210	8580	5263	8020	7490	6935	6905
Mean annual increase	399	373	390	239	365	340	315	314
Total increase rate (%)	28.48	27.21	13.42	9.74	28.49	27.15	11.86	11.86
Mean annual increase rate (%)	1.29	1.24	0.61	0.44	1.30	1.23	0.54	0.54

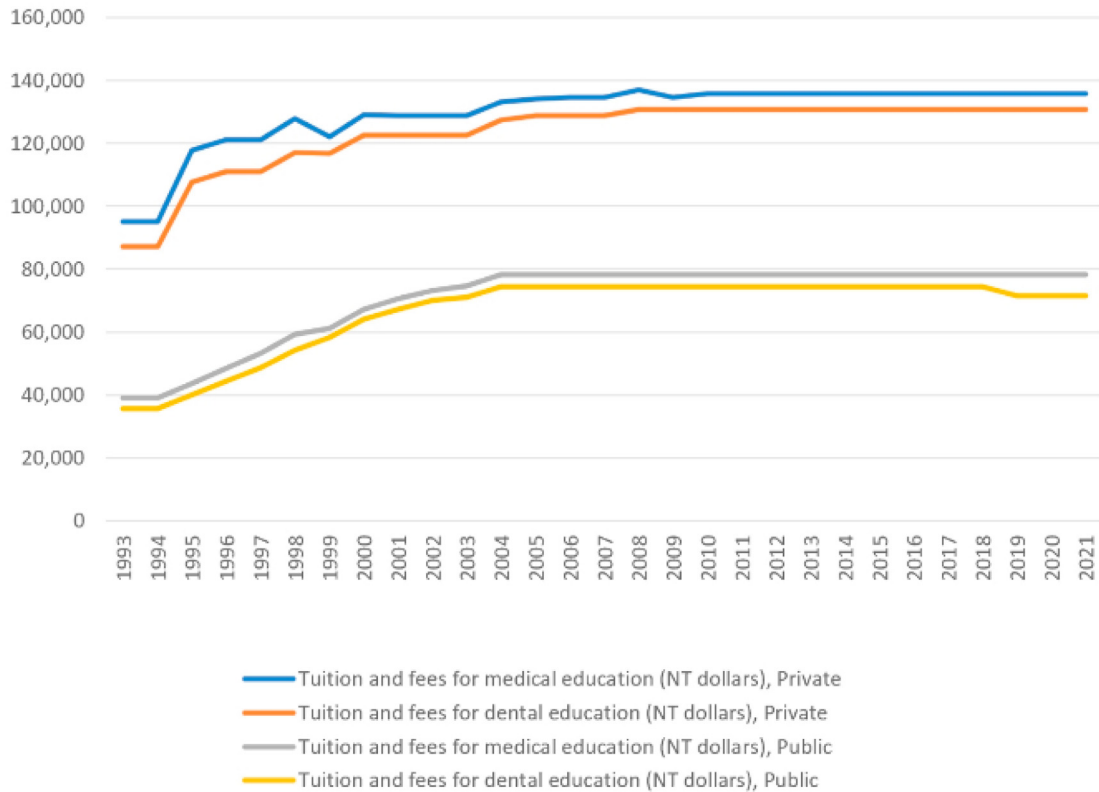


Fig. 1 One-year tuition and fees for medical education and dental education of each student in Taiwan from 1993 to 2021.

43,582 NT dollars from 1993 to 2021 with a mean annual increment of 1557 NT dollars, and the total increase rate was 50.04% from 1993 to 2021 with a mean annual increase rate of 1.79% (Table 1).

The increase amount of tuition and fees for public and private medical and dental schools were similar. However, due to the different baseline of their tuition and fees, that is, the tuition and fees of private schools were higher than those of public schools. Therefore, the increase rate of tuition and fees for public schools was higher than that for private schools. As a result, the gap between tuition and fees of public schools and those of private schools was shortened year by year. The ratio of tuition and fees of private medical schools to those of public medical school was reduced from 2.44 in 1993 to 1.73 in 2021, while the ratio of tuition and fees of private dental schools to those of public dental school was reduced from 2.44 in 1993 to 1.82 in 2021 (Table 1).

For the maximum and minimum semester tuition and fees for medical education from 1999 to 2021, the mean annual increase rates were 1.29% and 1.24% for public medical schools and 0.61% and 0.44% for private medical schools, respectively. For the maximum and minimum semester tuition and fees for dental education from 1999 to 2021, the mean annual increase rates were 1.30% and 1.23% for public dental schools and 0.54% and 0.54% for private dental schools, respectively (Table 2). These findings indicate that since the policy of setting its own tuition and fees standard by the university itself implemented in 1999, each university tends to be more conservative to increase its own tuition and fees.

The changes of one-year tuition and fees for medical education and dental education of each student relative to per economic indicator in Taiwan from 1993 to 2021

To consider the ratio of tuition and fees to economic indicators, the tuition and fees per capita GDP for medical education decreased from 13.15% to 32.09% in 1993 to 8.47% and 14.69% in 2021 for public and private medical schools, respectively (Fig. 2). For public medical schools, the total decrease was 4.68% from 1993 to 2021 with a mean annual decrement of 0.17%, and the total decrease rate was 35.59% from 1993 to 2021 with a mean annual decrease rate of 1.27% (Table 3). For private medical schools, the total decrease was 17.40% from 1993 to 2021 with a mean annual decrement of 0.62%, and the total decrease rate was 54.22% from 1993 to 2021 with a mean annual decrease rate of 1.94% (Table 3).

In addition, the tuition and fees per capita GDP for dental education decreased from 12.03% to 29.36% in 1993 to 7.74% and 14.13% in 2021 for public and private dental schools, respectively (Fig. 2). For public dental schools, the total decrease was 4.29% from 1993 to 2021 with a mean annual decrement of 0.15%, and the total decrease rate was 35.64% from 1993 to 2021 with a mean annual decrease rate of 1.27% (Table 3). For private dental schools, the total decrease was 15.23% from 1993 to 2021 with a mean annual decrement of 0.54%, and the total decrease rate was 51.86% from 1993 to 2021 with a mean annual decrease rate of 1.85% (Table 3).

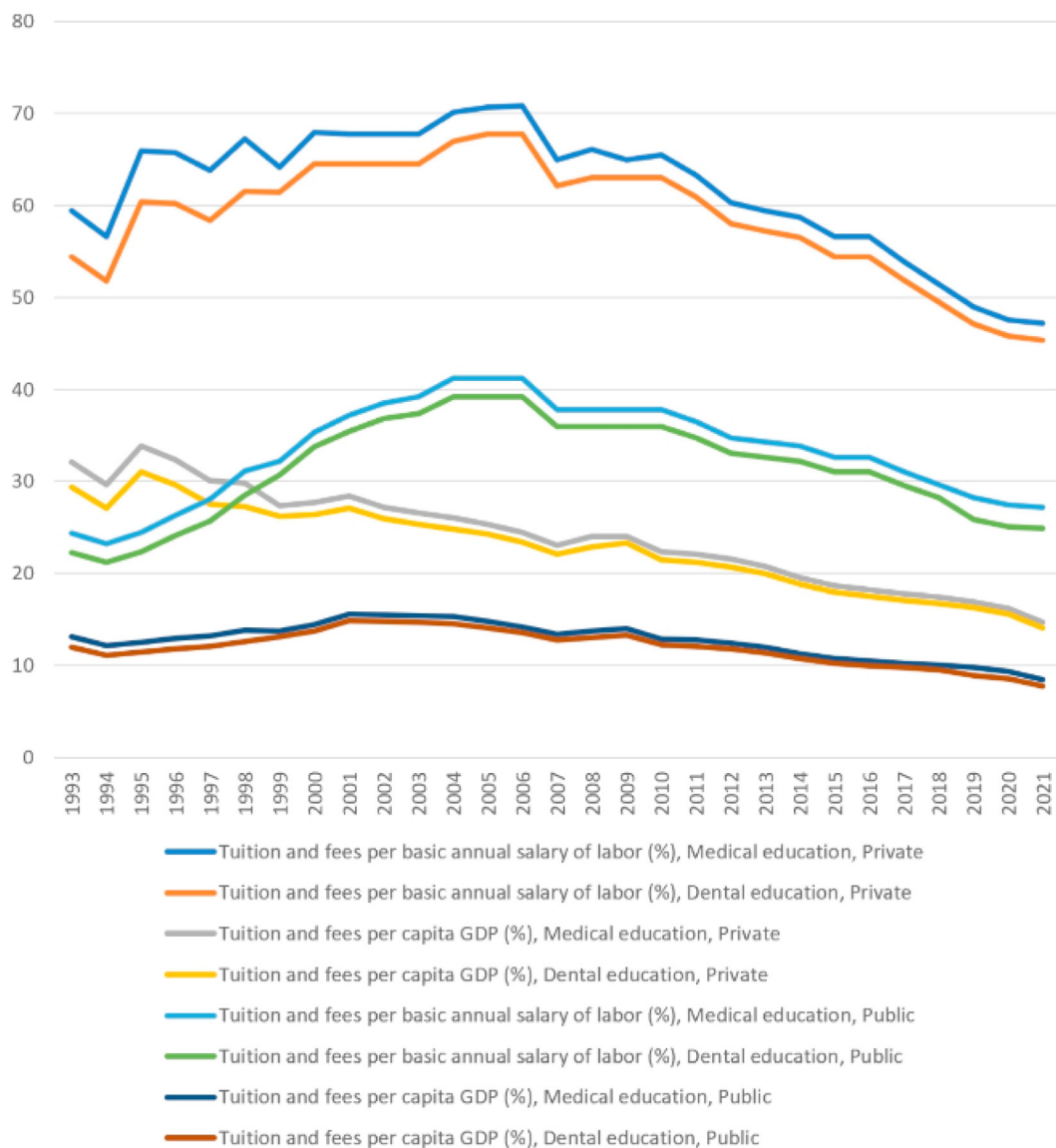


Fig. 2 One-year tuition and fees for medical education and dental education of each student relative to per economic indicator in Taiwan from 1993 to 2021.

On the other hand, the tuition and fees per basic annual salary of labor for medical education increased from 24.36% in 1993 to 27.20% in 2021 for public medical schools (Fig. 2). For public medical schools, the total increase was 2.84% from 1993 to 2021 with a mean annual increment of 0.10%, and the total increase rate was 11.66% from 1993 to 2021 with a mean increase rate of 0.42% (Table 3). The tuition and fees per basic annual salary of labor for medical education decreased from 59.43% in 1993 to 47.16% in 2021 for private medical schools (Fig. 2). For private medical schools, the total decrease was 12.27% from 1993 to 2021 with a mean annual decrement of 0.44%, and the total decrease rate was 20.65% from 1993 to 2021 with a mean annual decrease rate of 0.74% (Table 3).

Regarding the dental education, the tuition and fees per basic annual salary of labor for dental education increased from 22.28% in 1993 to 24.86% in 2021 for public dental schools (Fig. 2). For public dental schools, the total

increase was 2.58% from 1993 to 2021 with a mean annual increment of 0.09%, and the total increase rate was 11.58% from 1993 to 2021 with a mean increase rate of 0.41% (Table 3). The tuition and fees per basic annual salary of labor for dental education decreased from 54.37% in 1993 to 45.38% in 2021 for private dental schools (Fig. 2). For private dental schools, the total decrease was 8.99% from 1993 to 2021 with a mean annual decrement of 0.32%, and the total decrease rate was 16.53% from 1993 to 2021 with a mean annual decrease rate of 0.59% (Table 3).

The earlier tuition and fees per capita GDP for private medical and dental schools were much higher than those for public medical and dental schools, respectively. However, the decrease rates of tuition and fees per capita GDP for private medical and dental schools were higher than those for public medical and dental schools, respectively. As a result, the gap between tuition and fees per capita GDP for public schools and those for private schools was

Table 3 One-year tuition and fees for medical education and dental education of each student relative to per economic indicator in Taiwan from 1993 to 2021.

Year	Tuition and fees per capita GDP (%)				Tuition and fees per basic annual salary of labor (%)			
	Medical education		Dental education		Medical education		Dental education	
	Public	Private	Public	Private	Public	Private	Public	Private
1993	13.15	32.09	12.03	29.36	24.36	59.43	22.28	54.37
1994	12.14	29.61	11.10	27.09	23.21	56.63	21.23	51.81
1995	12.55	33.89	11.49	31.00	24.43	65.95	22.36	60.34
1996	12.94	32.36	11.84	29.61	26.30	65.76	24.07	60.17
1997	13.25	30.12	12.12	27.56	28.05	63.76	25.66	58.34
1998	13.80	29.80	12.62	27.27	31.13	67.26	28.47	61.54
1999	13.73	27.39	13.09	26.23	32.17	64.19	30.68	61.47
2000	14.45	27.74	13.78	26.35	35.38	67.95	33.74	64.54
2001	15.59	28.44	14.86	27.08	37.15	67.76	35.42	64.54
2002	15.46	27.22	14.80	25.92	38.49	67.76	36.84	64.54
2003	15.41	26.60	14.67	25.34	39.25	67.76	37.36	64.54
2004	15.30	26.03	14.56	24.85	41.21	70.11	39.22	66.96
2005	14.79	25.35	14.08	24.32	41.21	70.61	39.22	67.76
2006	14.22	24.44	13.53	23.38	41.21	70.82	39.22	67.76
2007	13.43	23.09	12.78	22.09	37.78	64.92	35.95	62.11
2008	13.73	24.02	13.07	22.92	37.78	66.06	35.95	63.02
2009	13.99	24.06	13.32	23.34	37.78	64.95	35.95	63.02
2010	12.89	22.36	12.27	21.51	37.78	65.50	35.95	63.02
2011	12.74	22.09	12.12	21.25	36.51	63.31	34.75	60.91
2012	12.42	21.53	11.82	20.72	34.76	60.27	33.08	57.99
2013	11.97	20.76	11.40	19.98	34.27	59.43	32.62	57.18
2014	11.28	19.55	10.73	18.81	33.87	58.73	32.23	56.50
2015	10.78	18.69	10.26	17.98	32.62	56.57	31.05	54.43
2016	10.49	18.19	9.99	17.51	32.62	56.57	31.05	54.43
2017	10.26	17.79	9.76	17.12	31.07	53.88	29.57	51.84
2018	10.05	17.43	9.57	16.77	29.67	51.45	28.24	49.50
2019	9.77	16.95	8.94	16.31	28.26	49.00	25.83	47.14
2020	9.33	16.18	8.53	15.57	27.43	47.56	25.07	45.76
2021	8.47	14.69	7.74	14.13	27.20	47.16	24.86	45.38
Total increase	-4.68	-17.40	-4.29	-15.23	2.84	-12.27	2.58	-8.99
Mean annual increase	-0.17	-0.62	-0.15	-0.54	0.10	-0.44	0.09	-0.32
Total increase rate (%)	-35.59	-54.22	-35.64	-51.86	11.66	-20.65	11.58	-16.53
Mean annual increase rate (%)	-1.27	-1.94	-1.27	-1.85	0.42	-0.74	0.41	-0.59

shortened year by year. Although the tuition and fees per basic annual salary of labor for public medical and dental schools were on the rise, those for private medical and dental schools decreased even more. Therefore, the gap between tuition and fees per basic annual salary of labor for public schools and those for private schools was also shortened year by year (Table 3).

Discussion

Although education gives hard-working people opportunities for social mobility, in addition to studying hard, the cost of obtaining admission to prestigious schools, tuition and fees, and the cost of completing studies are all invisible obstacles. Among these obstacles, tuition and fees are specific and quantifiable items, which are often used as the object of education cost research and analysis, and it is easy to make international comparisons.⁶

For a long time, the traditional social concept in Taiwan holds that students who attend medical schools or dental schools to become physicians or dentists in the future are the best channel of social mobility for students with low socioeconomic status. Therefore, this study aimed to understand the changes of actual tuition and fees for medical education and dental education in Taiwan over the past 28 years, by analyzing the association of tuition and fees with economic indicators and exploring the barriers posed by tuition and fees for medical education and dental education.

According to the websites of Ohio State University (OSU), Harvard School of Dental Medicine (HSDM), and Harvard Medical School (HMS), the average tuition and fees for medical education and dental education of OSU in the academic year from 2021 to 2022 (two semesters) were 38,138 and 45,773 US dollars, respectively. Moreover, the tuition (excluding other fees) for medical education in HMS

and dental education in HSDM in the academic year from 2021 to 2022 were both 66,284 US dollars. The capita GDP in the United States was last recorded as 58,510 US dollars in 2020. Therefore, the tuition and fees per capita GDP for medical education and dental education of OSU were 65.18% and 78.23%, respectively, and the tuition per capita GDP for medical education of HMS and dental education of HSDM were both 113.29%. The corresponding tuition and fees per capita GDP were 8.47% and 7.74% for medical education and dental education of public schools as well as 14.69% and 14.13% for medical education and dental education of private schools in Taiwan in 2021, respectively. Regardless of public and private schools, the absolute amount of tuition and fees for medical education and dental education as well as the ratio of tuition and fees to capital GDP in Taiwan are much lower than those in the United States. Furthermore, in the United States, the cultivation of physicians and dentists takes 4 years in the university and 4 years of post-baccalaureate education with a total of 8 years, while in Taiwan, it takes 6 years in the university. Therefore, in Taiwan, the tuition and fees for medical education and dental education are still low compared to the international corresponding data, mainly due to the subsidies provided by Taiwan government for tertiary education funds.¹

In the United States, high tuition and fees have become a barrier for students to enroll into the medical and dental schools, and also have a negative impact on the medical environment. However, the increased tuition results in a consequence of dramatic increase in enrollees from the high-income families. Therefore, the increase in tuition and fees appears to be a factor discouraging talented students from low-income families and underrepresented minorities from pursuing medical and dental careers.⁷ In the United States, students with larger amount of educational debts chose practice jobs in private clinics rather than in government or public health organizations due to the increased private sector compensation.⁸ Many low-income families rely on government or public health-based organizations for their oral health care because of their affordability compared to the payment for private practice. Many dentists may be reluctant to accept Medicaid. Because Medicaid on average only reimburses 49.4% of dental fees charged for adolescents and 37.2% of those charged for adults.⁹ In Canada, the rising costs of medical school education have a high potential to discourage highly qualified students from low-income backgrounds from applying to the medical school. There is an concern that medical students may gravitate to high-pay specialties after graduation because debt and financial pressure may make physicians more likely to see patients much quicker and acquire higher remuneration.¹⁰ The impact of high tuition and fees on the healthcare environment may exacerbate disparities in medical and oral healthcare services in underserved areas, since medical and dental students from underserved areas may be reluctant to return to serve their home communities.

The tuition and fees per capita GDP for tertiary education were 7.0% for public schools and 13.1% for private schools in Taiwan in 2020.¹¹ In contrast, regardless of public and private schools, the tuition and fees per capita GDP for medical education and dental education in Taiwan are

higher than those for general higher education. From 1993 to 2021, the tuition and fees of public medical and dental schools in Taiwan have been doubled. Moreover, the increase rate per year and the total increase rate of the public medical and dental schools are both higher than those of private medical and dental schools. In terms of economic indicators, the capita GDP has increased by more than 2-fold. Although tuition and fees for medical education and dental education have been increased year by year, the growth rate of national income has been even greater. Therefore, the ratio of tuition and fees to capita GDP has shown a decline. However, using the basic annual salary of labor as an indicator of the income of families with low socioeconomic status, the increase in the basic annual salary of labor has not reached 80% from 1993 to 2021. Therefore, it shows that the ratio of tuition and fees to basic annual salary of labor has shown a slight increase for public medical and dental schools and a decrease for private medical and dental schools. The decline of tuition and fees for private medical and dental schools was due to the lower increase rate of their tuition and fees. Although the pressure of paying the tuition and fees for medical education and dental education may decrease for the ordinary families due to the increase of national income, this burden may not decrease or even increase for families with low socioeconomic status. Considering that the dividends of economic growth are still concentrated in families with high socioeconomic status or middle-class families, the pressure from paying tuition and fees is indeed reduced for them, but this may not be the case for families with low socioeconomic status or ordinary families.

Taiwan is a free economic market society close to the United States. The free economic market society generally adopts the orientation of high tuition and fees for tertiary education. The United States adopts consumerism for tertiary education, and considers that the main buyers of tertiary education are students and parents. Tertiary education is a commodity, so the orientation of high tuition and fees is inevitable. Nonetheless, the equality for educational opportunities has always been one of the concerns of the Taiwan government. Therefore, the government adopts low tuition and fees policy for students who receive university education, and regards education as the expansion of public service, social responsibility, investment and human capital utility, and the bridge to promote social class mobility.⁶

The biggest obstacle for students to enroll into medical and dental schools is undoubtedly the economic factor. Unlike the obstacle of super high tuition and fees for medical education and dental education in the United States, obtaining an admission permit to enroll into medical and dental schools may be the biggest obstacle in Taiwan. Taking dentistry as an example, Taiwan recruits less than 400 dental freshmen through the university entrance examination system every year. However, in recent years, there are as many as 150–200 dental graduates returning from abroad every year, which has caused a lot of impact on Taiwan's dental professional environment.^{4,5} Under the commercialization of tertiary education, medical and dental tuition and fees in Taiwan have also increased. Although the tuition and fees for tertiary education in Taiwan are lower than those in the United States, the cost

of medical and dental education is not limited to the tuition and fees but includes the cost of obtaining an admission permit and the living expenses of studying. Other extra costs should also be considered together. In traditional Taiwan's society, there is a concept of preferring to study medicine and dentistry. Therefore, students who are unable to obtain an admission permit of the domestic medical or dental schools are prone to seek admission from foreign medical and dental schools. All of the above-mentioned associated situations have greatly increased the costs for students to become physicians or dentists, and these high costs may be passed onto patients in their future practice, which is not conducive to public health promotion and patient health maintenance.

In Taiwan, the tuition and fees for medical education are always higher than the tuition and fees for dental education for a long time. Interestingly, as early as 1999, the policy of setting its own tuition and fees standard by each university has been implemented, and the minimum tuition and fees for dental education of private schools exceeded the minimum tuition and fees for medical education of private schools, and the situation was persistent until now. There is a trend of lower tuition and fees for some private medical schools, which may have other sources of subsidy such as religious and charitable donations, and this specific policy encourages the admission of disadvantaged students through paying less tuition and fees per student.

We believe that students from families with high socioeconomic status have more advantageous educational resources and are more likely to obtain admission to medical and dental schools than students from families with low socioeconomic status or ordinary families. Even if they cannot obtain admission by examination, they are able to study abroad. However, many of these students from families with high socioeconomic status also come from urban areas, and the majority of them often practice in the urban areas after becoming a physician or a dentist, resulting in the worsening of the urban-rural gap in medical and dental resources.

In the process of commercialization of tertiary education, in addition to allowing reasonable increases of tuition and fees, the government should also consider to let the disadvantaged students pay less tuition and fees and assist disadvantaged students through school loans, school grants or scholarships. The government should also consider to improve the opportunities for students from disadvantaged families, such as students from families

with low socioeconomic status and remote areas, to enroll in medical and dental schools through the admission system. Moreover, it is also an important issue to avoid excessive concentration of opportunities to students from wealthy families to enroll in medical and dental schools.

Declaration of competing interest

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

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