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RESEARCH ARTICLE

Factors that influence the choice to work in rural township health centers among 4,669 clinical medical students from five medical universities in Guangxi, China

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Abstract

Purpose: To produce competent undergraduate-level medical doctors for rural township health centers (THCs), the Chinese government mandated that medical colleges in Central and Western China recruit rural-oriented, tuition-waived medical students (RTMSs) starting in 2010. This study aimed to identify and assess factors that influence the choice to work in rural township health centers among both RTMSs and other students from five medical universities in Guangxi, China. **Methods:** An internet-based self-administered questionnaire survey was conducted with medical students in Guangxi province. Multinomial logistic regression was used to identify factors related to the attitudes toward work in a rural township health center. **Results:** Among 4,669 medical students, 1,523 (33%) had a positive attitude and 2,574 (55%) had a neutral attitude toward working in THCs. Demographic characteristics, personal job concerns, and knowledge of THCs were associated with the choice of a career in THCs. The factors related to a positive attitude included the following: three-year program, a rural-oriented medical program, being male, an expectation of working in a county or township, a focus on medical career development, some perceived difficulty of getting a job, having family support, sufficient knowledge of THCs, optimism toward THC development, seeking lower working pressure, and a lower expected monthly salary. **Conclusion:** Male students in a three-year program or a rural-oriented tuition-waived medical education program were more likely to work in THCs. Selecting medical students through interviews to identify their family support and intentions to work in THCs would increase recruitment and retention. Establishing favorable policies and financial incentives to improve living conditions and the social status of rural physicians is necessary.

Key Words: *Career choice; China; Motivation; Rural health services; Salaries and fringe benefits*

INTRODUCTION

The unequal distribution of health workers between urban and rural or remote areas is a global concern. Lack of access to health workers in rural regions often leads to comparatively high costs for rural residents in seeking care at urban health facilities [1,2]. In China, the rural primary medical institutions consist of a three-tier system including village clinics, township health centers (THCs), and a county hospitals. THCs play an essential role in providing rural medical services [3]. It has been well documented that a shortage of qualified medical professionals in THCs is one of the major challenges of the current Chinese healthcare system. The Chinese tertiary medical education system offering bachelor's degrees or above was expanded in 1998, mostly in larger cities. At the same time, secondary medical technical schools offering three years of basic medical training have been left behind [4]. Almost all graduates with a university level of education choose to work in big cities. Consequently, rural health institutions such as

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THCs must employ health workers with limited education [5]. To produce competent undergraduate-level medical doctors for rural THCs, the Chinese government started a rural-oriented tuition-waived medical education (RTME) program in 2010. The aim has been to enroll students from rural areas to work in THCs for six years after their graduation [6]. The government waived tuition for these students and gave them a certain living allowance during their studies in a medical university. Apart from this, the government has set many other policies favorable to producing competent doctors to serve rural THCs [7]. However, there is still a large shortage of doctors in THCs. Therefore, gaining an understanding of current medical students' intent to work in rural THCs is necessary.

The Guangxi Zhuang Autonomous Region is a Southwest province with 82% of the 51.59 million population that lives in rural areas. Currently, there are four medical institutions offering five-year undergraduate-level medical education: Guangxi Medical University (GXMU), Guilin Medical University (GLMU), Youjiang Medical University for Nationalities (YMUN), and Guangxi Traditional Chinese Medical University (GTCMU). There is one medical institute providing three-year junior degree education, the Medical College of Guangxi University of Technology (GUT). When the RTME program was established in Guangxi in 2010, the first three medical universities qualified to enroll students were Guangxi Medical University, Guilin Medical University, and Youjiang Medical University for Nationalities. The three universities were geographically located in the south, north, and west of the province. Every year, GXMU was eligible to enroll 100 rural-oriented, tuition-waived medical students (RTMS), and the other two universities were each eligible to enroll 50 students. In addition, all five medical universities matriculate 100 to 400 normal track students according to the quota set by the Ministry of Education for over twenty provinces in China. Whether these students' varying characteristics such as demographic data, perceptions on their career, and knowledge of THCs have an influence on their intention to work in rural THCs has not, to our knowledge, been studied in a large sample of students in multiple universities.

This study aims to survey the intention to work in THCs of medical students in all of the five medical universities in Guangxi province and to identify potential factors contributing to their choices.

METHODS

Study design

This survey was conducted from May to August 2012 via an internet-based self-administered questionnaire developed by the Department of Education of Guangxi Province. The Employment Guidance Centers in each medical university organized the survey and ensured quality control.

Study population

All third-, fourth-, and fifth-year students in the five-year programs and first-, second-, and third-year students in the three-year program in the five medical schools in Guangxi province were included in the study.

Questionnaire

The questionnaire included four parts: demographic information, personal job concerns and factors influencing them, knowledge of THCs and related factors, and intention to work in a THC. A small pilot study was conducted with paper questionnaires for the first-year medical students in Guangxi Medical University to verify suitability of the questions. Two epidemiologists, a statistician, and two other specialists from the Department of Education reviewed the questionnaires to ensure their validity.

Dataset and ethical clearance

The data was retrieved from Internet centers in all of the medical universities in Guangxi. All personal identification was encrypted. The Ethics Committee of the Guangxi Medical University approved the study protocol.

Data analysis

All data analyses were performed using R version 3.1.3 (http://www.r-project.org) and EpiCalc package 2.15.1.0 (http://CRAN.R-project.org/package = epicalc). The willingness to work in THCs was classified into four levels: (1) I am very willing to work in a THC; (2) I am willing to work in a THC; (3) I will consider working in a THC if I cannot find a job; (4) I will not go to work in a THC even if I cannot find a job. To analyze the data, the first two levels were labeled as a positive attitude, the third level as a neutral attitude, and the fourth level as a negative attitude. The chi-square test was use to study the association of demographic characteristics, personal job concerns, and knowledge of THCs with the three different attitudes toward working in THCs. A multinomial logistic regression model was used to identify the factors related to the attitudes toward working in THCs adjusted for potential confounders. The statistical significance level was set at < 0.05.

RESULTS

Among 5,256 medical students invited to participate in the survey, 4,669 responded, yielding a response rate of 88.8%. Out of the total of 4,669 medical students, 1,523 (33%) of them had positive attitudes, 2,574 (55%) had neutral attitudes, and

572 (12%) had negative attitudes toward working in THCs. Table 1 summarizes the demographic characteristics related to different attitudes toward working in THCs. Gender, a one-child family of origin, place of birth, and years of one's educational program, major, and school were found to be significantly related to the type of attitude. Female students, those

Table 1. Demographic characteristics related to attitudes toward working in township health centers

Characteristic		Negative (%)	Positive (%)	Neutral (%)
Gender[a]	Male	291 (50.9)	680 (44.6)	973 (37.8)
	Female	281 (49.1)	843 (55.4)	1,601 (62.2)
One-child family[a]	No	408 (71.3)	1,286 (84.4)	2,126 (82.6)
	Yes	164 (28.7)	237 (15.6)	448 (17.4)
Place of birth[a]	City	139 (24.3)	147 (9.7)	399 (15.5)
	County	121 (21.2)	255 (16.7)	442 (17.2)
	Village	312 (54.5)	1,121 (73.6)	1,733 (67.3)
Program[a]	Three-year program	17 (3.0)	694 (45.6)	283 (11.0)
	Five-year program	555 (97.0)	829 (54.4)	2,291 (89.0)
Major[a]	Bachelor's degree: clinical medicine	470 (82.2)	728 (47.8)	1,792 (69.6)
	Bachelor's degree: rural-oriented medicine	2 (0.3)	20 (1.3)	38 (1.5)
	Bachelor's degree: traditional medicine	90 (15.7)	358 (23.5)	561 (21.8)
	Junior bachelor's degree: clinical medicine	10 (1.7)	417 (27.4)	183 (7.1)
School[a]	Guangxi Medical University	264 (46.2)	123 (8.1)	591 (23.0)
	Guangxi Traditional Chinese Medical University	110 (19.2)	437 (28.7)	726 (28.2)
	Guilin Medical University	89 (15.6)	151 (9.9)	471 (18.3)
	Youjiang Medical University for Nationalities	92 (16.1)	118 (7.7)	503 (19.5)
	Guangxi University of Technology	17 (3.0)	694 (45.6)	283 (11.0)

Numbers in brackets are percentages unless otherwise stated.
[a]P-value < 0.001.

Table 2. Personal job concerns and factors influencing them classified by attitudes toward working in township health centers

Variable	Negative (%)	Positive (%)	Neutral (%)
Perceived difficulty of getting a job[a]			
Very difficult	146 (25.5)	392 (25.7)	895 (34.8)
Difficult	98 (17.1)	150 (9.8)	313 (12.2)
Somewhat difficult	211 (36.9)	776 (51)	1,173 (45.6)
Easy	117 (20.5)	205 (13.5)	193 (7.5)
Expected place of work[a]			
Provincial city	122 (21.3)	91 (6.0)	194 (7.5)
Prefecture city	388 (67.8)	539 (35.4)	1,700 (66.0)
County	58 (10.1)	645 (42.4)	659 (25.6)
Township	4 (0.7)	248 (16.3)	21 (0.8)
Factor of greatest influence[a]			
Government employment	14 (2.5)	22 (1.4)	60 (2.3)
Personal career development	120 (21.1)	376 (24.7)	652 (25.3)
Social recognition	8 (1.4)	7 (0.5)	16 (0.6)
Family support	11 (1.9)	51 (3.4)	74 (2.9)
Living environment	92 (16.1)	173 (11.4)	348 (13.5)
Individual interest	33 (5.8)	77 (5.1)	91 (3.5)
Salary and benefits	145 (25.4)	196 (12.9)	492 (19.1)
Relevance to study	147 (25.8)	620 (40.7)	839 (32.6)
Person of greatest influence[b]			
Parents	342 (75.0)	1,000 (80.4)	1,633 (77.4)
Teachers	10 (2.2)	45 (3.6)	61 (2.9)
Lovers	77 (16.9)	141 (11.3)	317 (15.0)
Classmates	8 (1.8)	15 (1.2)	33 (1.6)
Senior classmates	19 (4.2)	43 (3.5)	66 (3.1)

Numbers in brackets are percentages unless otherwise stated.
[a]P-value < 0.001. [b]P-value < 0.05.

not from a one-child family, and those born in a village or county were more likely to have positive attitudes toward working in THCs.

Table 2 shows that the students' personal job concerns and factors influencing them contributed to their attitudes toward working in THCs. The students who expected to work in a county and were focused on relevant studies were more likely to have positive or neutral attitudes. In contrast, those who intended to work in a city were less likely to be willing to work in a THC.

Table 3. Knowledge of THC and factors influencing this, classified by attitudes toward working in THCs

Variable	Negative (%)	Positive (%)	Neutral (%)
Knowledge of the status of THCs[a]			
Little	283 (49.5)	344 (22.6)	873 (33.9)
Some	223 (39.0)	863 (56.7)	1,411 (54.8)
Sufficient	40 (7.0)	242 (15.9)	258 (10.0)
Very sufficient	26 (4.5)	74 (4.9)	32 (1.2)
Attitude toward THCs[a]			
Very pessimistic	122 (21.3)	53 (3.5)	165 (6.4)
Pessimistic	183 (32.0)	206 (13.5)	685 (26.6)
Optimistic	221 (38.6)	832 (54.6)	1,438 (55.9)
Very optimistic	46 (8.0)	432 (28.4)	286 (11.1)
Perceived weaknesses of THCs			
Limited career development	163 (30.5)	427 (29.3)	771 (31.1)
Poor living conditions	98 (18.3)	220 (15.1)	351 (14.2)
Undesirable salary and benefits	143 (26.7)	387 (26.6)	653 (26.3)
Limited hospital development	131 (24.5)	423 (29)	705 (28.4)
Perceived heath workforce in THCs[a]			
Very deficient, urgent to reinforce	324 (56.6)	809 (53.1)	1,463 (56.8)
High attrition, reinforcement needed	153 (26.7)	506 (33.2)	791 (30.7)
Limited, but can be maintained	76 (13.3)	197 (12.9)	315 (12.2)
Sufficient, complete team	19 (3.3)	11 (0.7)	5 (0.2)
Who should go to work in a THC[a]			
Secondary health school graduates	99 (17.3)	51 (3.3)	169 (6.6)
Junior college graduates	354 (61.9)	761 (50)	1,449 (56.3)
Bachelor's degree gradates	119 (20.8)	711 (46.7)	956 (37.1)
Expected salary[a]			
More than 4,000 RMB	168 (29.4)	79 (5.2)	210 (8.2)
1,000-1,500 RMB	24 (4.2)	213 (14.0)	162 (6.3)
1,500-2,000 RMB	71 (12.4)	621 (40.8)	738 (28.7)
2,000-3,000 RMB	175 (30.6)	431 (28.3)	1,007 (39.1)
3,000-4,000 RMB	112 (19.6)	152 (10.0)	437 (17.0)
Facilitating factors[a]			
Close to home	30 (7.8)	122 (8)	194 (7.9)
Favorable policy	152 (39.7)	402 (26.5)	862 (35.1)
Obtain community experience for a better job later	45 (11.7)	218 (14.4)	352 (14.3)
Lower working pressure	13 (3.4)	73 (4.8)	200 (8.1)
No opportunity to find a suitable job	65 (17.0)	21 (1.4)	349 (14.2)
Time to prepare for graduate entrance examination	27 (7.0)	13 (0.9)	60 (2.4)
More opportunities to practice, greater potential in THCs	18 (4.7)	388 (25.6)	281 (11.5)
Respond to the nation's call to return to one's hometown	33 (8.6)	279 (18.4)	156 (6.4)
Inhibiting factors[a]			
Unfamiliar with rural conditions	15 (2.7)	67 (5.0)	54 (2.2)
Low salary and poor benefits	143 (25.4)	370 (27.8)	715 (28.7)
Difficult to develop skills	122 (21.7)	372 (27.9)	732 (29.4)
Poor living conditions	213 (37.8)	352 (26.4)	701 (28.2)
Family and friends' opposition	10 (1.8)	34 (2.6)	41 (1.6)
Low social status	16 (2.8)	35 (2.6)	50 (2.0)
No continuing medical education opportunities	44 (7.8)	101 (7.6)	194 (7.8)

Numbers in brackets are percentages unless otherwise stated.
THC, township health centers.
[a]P-value < 0.001.

As shown in Table 3, the students' knowledge of THCs and THC-related perceptions had a great bearing on their attitudes and choices. The students with optimistic attitudes and somewhat knowledgeable were more willing to work in THCs; mean-

Table 4. Adjusted RRRs with 95% CIs from a multinomial logistic regression model with the negative attitude to working in a township health center as reference

Variable	Positive		Neutral	
	RRRs	95% CI	RRRs	95% CI
Demographic characteristics				
Gender: female vs. male	0.62[a]	(0.42, 0.92)	0.80	(0.56, 1.15)
One child family: no vs. yes	1.32	(0.94, 1.84)	1.39	(0.88, 2.19)
Place of birth: (ref: city)				
County	1.34	(0.90, 2.00)	0.93	(0.67, 1.28)
Village	1.40	(0.96, 2.03)	1.20	(0.88, 1.63)
Program: three-year vs. five-year	4.83[b]	(3.15, 7.39)	1.83[b]	(1.21, 2.78)
Major: (ref: bachelor's degree: clinical medicine)				
Bachelor's degree: rural-oriented medicine	6.58[a]	(1.37, 31.63)	3.45	(0.77, 15.39)
Bachelor's degree: traditional medicine	1.05	(0.57, 1.94)	0.76	(0.44, 1.34)
Junior bachelor's degree: clinical medicine	1.24	(0.32, 2.54)	1.09	(0.39, 3.11)
School: (ref: Guangxi Medical University)				
Guangxi Traditional Chinese Medical University	1.77	(0.78, 3.40)	1.38	(0.51, 6.81)
Guilin Medical University	1.50	(0.84, 2.68)	1.34	(0.84, 3.21)
Youjiang Medical University for Nationalities	1.39	(0.75, 2.57)	1.11	(0.49, 3.15)
Guangxi University of Technology	4.61[c]	(2.42, 8.78)	1.93[a]	(1.03, 3.63)
Personal job concerns and factors influencing them				
Perceived difficulty of getting a job: (ref: easy)				
Somewhat difficult	2.44[b]	(1.37, 4.35)	2.7[c]	5 (1.65, 4.59)
Difficult	1.42	(0.79, 2.55)	1.86[a]	(1.12, 3.11)
Very difficult	1.34	(0.66, 2.71)	1.74	(0.95, 3.20)
Expected place of work: (ref: provincial city)				
Prefecture city	2.10[a]	(1.19, 3.72)	2.15[b]	(1.34, 3.45)
County	8.65[c]	(4.21, 17.77)	4.35[c]	(2.30, 8.23)
Township	14.54[b]	(3.83, 31.74)	3.17	(0.36, 28.13)
Factor of greatest influence (ref: government employment)				
Personal career development	5.39[b]	(1.61, 18.11)	2.06	(0.78, 5.44)
Social recognition	0.39	(0.05, 2.86)	0.43	(0.12, 1.58)
Family support	5.19[a]	(1.01, 26.73)	1.92	(0.48, 7.71)
Living environment	1.74	(0.51, 5.93)	0.79	(0.30, 2.08)
Individual interest	2.55	(0.64, 10.09)	0.56	(0.18, 1.72)
Salary and benefits	3.53[a]	(1.06,11.75)	1.26	(0.49, 3.27)
Relevance to major	5.17[b]	(1.59, 16.81)	1.31	(0.51, 3.34)
Knowledge of THCs and factors influencing this Knowledge of status of THCs: (ref: little)				
Some	1.60[b]	(1.06, 2.42)	1.57[a]	(1.10, 2.25)
Sufficient	3.05[b]	(1.56, 5.95)	1.86[a]	(1.01, 3.43)
Very sufficient	2.77[a]	(1.06, 7.23)	0.72	(0.29, 1.79)
Attitudes toward THCs (ref: very pessimistic)				
Pessimistic	1.55	(0.78, 3.07)	1.44	(0.86, 2.41)
Optimistic	4.66[c]	(2.38, 9.13)	3.07[c]	(1.82, 5.17)
Very optimistic	9.38[c]	(4.08, 21.57)	3.36[c]	(1.64, 6.89)
Who should go to work in THCs (ref: secondary health school graduates)				
Junior college graduates	2.26[a]	(1.17, 4.35)	1.57	(0.96, 2.57)
Bachelor's degree gradates	9.29[c]	(4.61, 18.73)	3.09[c]	(1.79, 5.35)
Expected salary: (ref: > 4,000 RMB)				
1,000-1,500 RMB	3.10[a]	(1.07, 5.89)	1.65[a]	(1.09, 3.55)
1,500-2,000 RMB	4.81[c]	(1.82, 7.06)	2.33[b]	(1.56, 4.76)
2,000-3,000 RMB	2.66[b]	(1.61, 4.38)	3.84[c]	(2.64, 6.01)
3,000-4,000 RMB	0.88	(0.27, 3.98)	1.82	(0.50, 1.43)

(continued to the next page)

Table 4. Continued

Variable	Positive		Neutral	
	RRRs	95% CI	RRRs	95% CI
Facilitating factors (ref: close to home)				
Favorable policy	0.79	(0.40, 1.57)	1.00	(0.55, 1.85)
Gain community experience for a better job	0.91	(0.42, 2.01)	1.23	(0.61, 2.49)
Lower working pressure	3.69[a)]	(1.11, 12.32)	4.38[a)]	(1.42, 13.48)
No opportunity to find a suitable job	0.13[c)]	(0.05, 0.36)	1.32	(0.66, 2.64)
Prepare for graduate entrance examination	0.30	(0.09, 1.04)	0.50	(0.19, 1.30)
More opportunities to practice, great potential in THCs	3.66[b)]	(1.40, 9.56)	2.24	(0.90, 5.54)
Respond to the nation's call to return to one's hometown	2.28	(0.98, 5.3)	0.84	(0.38, 1.83)
Inhibiting factors (ref: I am unfamiliar with rural conditions)				
Low salary and poor benefits	0.53	(0.22, 1.28)	0.35[a)]	(0.15, 0.8)
Difficult to develop abilities	0.44	(0.18, 1.07)	0.36[a)]	(0.16, 0.81)
Poor living conditions	0.35[a)]	(0.14, 0.91)	0.27[b)]	(0.11, 0.64)
Family and friends' opposition	0.59	(0.20, 1.72)	0.35	(0.11, 1.09)
Low social status	0.25[b)]	(0.09, 0.66)	0.38	(0.14, 1.02)
No continuing medical education opportunities	0.72	(0.30, 1.72)	0.32[b)]	(0.13, 0.76)

RRRS, relative risk ratios; CI, confidence intervals.
[a)]P-value < 0.05, [b)]P-value < 0.01, [c)]P-value < 0.001.

while, they had a comparatively lower expected salary compared with the negative and neutral attitude groups. Favorable policies were regarded as the most important facilitating factor, while the three most common inhibiting factors were difficulty of developing skills, low salary and benefits, and poor living conditions.

Table 4 shows the adjusted relative risk ratios using a multinomial logistic regression model. The reference group was those students with negative attitudes toward working in THCs. A three-year program and major in rural-oriented medicine were factors promoting intention to work in a rural area. Female students were less positive about rural medical service. The students who expected to work in a county or township and who perceived getting a job to be somewhat difficult were more likely to accept rural work. The most important factors influencing their choice were personal career development, relevance of work to one's major, family support, and salary. Lower working pressure and more opportunities to practice were facilitating factors, whereas poor living conditions and low social status were factors inhibiting work in THCs.

DISCUSSION

Shortages and an uneven distribution of the health workforce have been global issues for a long time . In order to produce more health workers, China has expanded its higher medical education [4,8] and has increased the total number of health workers in the past decade, but this has not resulted in better rural-urban equity [9]. Meanwhile, the aging and brain drain of the rural health workforce are making the situation much worse. One study reported that 1,523 out of 4,669 (33%) medical students had a positive attitude toward working in rural THCs, and 2,574 (55%) students had a neutral attitude toward working in THCs. It would be feasible to reach the goal of "one doctor, one township hospital" for all of the 1,294 THCs in Guangxi based on the number of graduates produced by medical universities. However, the high rate of mobility of rural doctors to high-level health facilities means that measures to increase retention rather than simple recruitment should be taken [10].

The finding that male students from three-year programs and those majoring in rural-oriented medicine were more likely to choose to work in THCs has important implications. The students from the RTME program were 6.58 times more likely to plan to work in THCs. The three-year program in Guangxi University of technology was another factor promoting rural service. The current RTME program is a five-year bachelor's degree program with a major in clinical medicine. If this program were shifted into a three-year junior college, it would be more likely to produce students with an intention to work in a rural area.

This study also suggested that family support and medical career development were important factors influencing intention to work in a rural area. Other studies have shown similar results—that family and community support were essential to recruitment and retention for rural physicians because of the professional and living isolation involved in rural service [11]. In selecting medical students, many countries have used interviews as a non-academic measure to assess students' suitability, which would take students' values and personal characteristics into account [12]. An interview process to select those medical students with good family support and interest in developing a

career in township hospitals would be recommended.

The fact that students with sufficient knowledge about THCs and optimism towards THC development would be more likely to work in rural THCs has important implications. The World Health Organization has recommended educational interventions to increase recruitment and retention of rural health workers such as recruiting students of rural origin, locating medical schools outside major cities, bringing students to rural communities, and matching curricula with rural health needs. These measures were found to increase medical students' knowledge of and capability to perform rural medical service and have proved to be effective in reality [2]. Taking these measures would be helpful in improving the curriculum design and clinical placement of rural-oriented medical education programs.

In addition, providing the appropriate infrastructure and competitive remuneration are necessary strategies to retain a rural health workforce [13,14]. This study has revealed that the students who were optimistic about the potential development of THCs had positive attitudes toward rural service. Their expected salary was from 1,000 RMB to 3,000 RMB, which was comparatively low. Meanwhile, poor living conditions and low social status were inhibiting factors. Therefore, the government should continuously offer favorable policies and financial incentives to attract and retain a rural health workforce, while at the same time, to improve the living conditions and social status of rural physicians.

In conclusion, male students in three-year programs or rural-oriented tuition waiver medical education programs were more likely to choose to work in THCs. Selecting medical students through interviewing to identify their family support and intentions to work in THCs would increase recruitment and retention. Designing a proper curriculum and offering rural clinical placement in medical education would increase medical students' knowledge of and capability to perform rural service. Favorable policies and financial incentives to improve the living conditions and social status of rural physicians will be necessary in the long term.

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

SUPPLEMENTARY MATERIAL

Audio recording of abstract.

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