

BMJ Open Demographic and motivational factors affecting the whole-body donation programme in Nanjing, China: a cross-sectional survey

Jiayi Jiang,¹ Mingyi Zhang,¹ Haojie Meng,¹ Xiang Cui,² Yuxin Yang,³ Li Yuan,³ Chuan Su,³ Jinfan Wang,⁴ Luqing Zhang ^{3,4,5}

To cite: Jiang J, Zhang M, Meng H, *et al*. Demographic and motivational factors affecting the whole-body donation programme in Nanjing, China: a cross-sectional survey. *BMJ Open* 2020;**10**:e035539. doi:10.1136/bmjopen-2019-035539

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2019-035539>).

JJ and MZ contributed equally.

Received 05 November 2019

Revised 28 June 2020

Accepted 04 August 2020



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Luqing Zhang;
luqingzh@njmu.edu.cn

ABSTRACT

Objectives To investigate the demographics and motivations of whole-body donors in China, and help suggest a solution to the problem of low body donation numbers.

Design A cross-sectional study on body donors in China. Demographic analysis of the donating information of deceased donors and in-depth interviews of potential body donors.

Setting Eleven districts in Nanjing, China.

Participants Deceased whole-body donors who had donated their bodies to the body donation receiving station of Nanjing Medical University between 1 July 2009 and 30 June 2019 (n=835), and living registered whole-body donors (n=68).

Results Among the whole-body donor population, the numbers of males, people older than 65 years and those working as teachers, government officials, medical staff and farmers were significantly higher than those of the general Nanjing population. Donors with an education level of college or above accounted for nearly half of the deceased donors, and considered donating their bodies earlier in their lives than others. Cancer and heart disease were the major causes of death among donors. Interviews of the 68 living donors revealed the following major motivations for the decision to donate: to support medical education; to reduce their children's funeral burden; no longer holding traditional Chinese views on life and death; influence by role models and annoyance at complex funeral ceremonies.

Conclusions Older people, people with an education level of college or above, labourers, teachers, government officials and farmers are the major groups that donate their bodies. Although people's motivations for donation are complex, their desire to support medical education is the most prevalent motivation. By helping focus on target groups for promotional messaging and identifying their prime motivations, this study's findings can provide a reference for promoting body donation in China.

INTRODUCTION

Human anatomy is a fundamental subject in medical education and an inextricable part of medical science. Although more and more computer simulation technology is being

Strengths and limitations of this study

- This study examined the demographic characteristics of people who donate their bodies for use as cadavers for dissection during the training of medical undergraduates, and living registered whole-body donors' motivations for body donation in China.
- This study focuses particularly on donors' positive motivations and determines the subjective reasons for people donating their bodies.
- There is a shortage of cadavers for the anatomical training of medical students in China, and this study may lead to policy insights for encouraging more people to donate their bodies.
- The study was conducted in Nanjing, and thus the results may not be generalisable to other parts of China.

used in anatomy teaching, human specimen and cadaver dissection remain irreplaceable educational tools, giving medical students first-hand knowledge of the human body.¹⁻³ The practical experience of cadaver dissection provides students with a deep understanding of the structure of the human body, which the exclusive use of multimedia tools or an anatomical atlas cannot replace. Moreover, cadaver-based learning helps students to gain direct knowledge of pathological changes and causes of death in the human body. As such, human cadavers remain indispensable for the training of medical doctors and for conducting medical research at some medical schools.⁴ Therefore, to cultivate solid anatomical knowledge, medical schools need sufficient cadavers for dissection practice.⁵⁻⁷

However, the body donation programme in China has met with difficulties, leading to an insufficient supply of cadavers to meet the needs of medical education.⁸ Although Shanghai launched its body donation programme in 1982, some big cities such as



Beijing, Nanjing, Shandong and Chongqing did not start to accept voluntarily donated bodies until the 1990s. At present, only a few large cities or coastal cities in China receive more than 100 bodies annually. In most other cities, the number of donated bodies per year is substantially lower.⁸ Body donation programmes are well established as the exclusive source of bodies in most parts of Europe and North America.⁶ In these countries, there tend to be four to five anatomy students for each cadaver available for dissection,⁹ while currently very few medical schools in China can meet this requirement. In most medical schools in China, 15–20 or even more students share a cadaver, and PowerPoint presentations, anatomical atlases, images, models and three-dimensional virtual simulations are also used to teach anatomy when there is an insufficient supply of dissection material.^{10 11} The shortage of cadavers has greatly hindered the development of medical anatomy teaching.

Nanjing, the capital of Jiangsu province, has a well-developed body donation programme and has been at the forefront of the work on body donations. As such, it can serve as a good reference for those seeking to understand donors' motivations. At the end of 1995, with support from Nanjing Medical University (NMU) and Southeast University, 14 retired Nanjing government officials joined an initiative to donate their bodies to society. This marked the official launch of the body donation programme. The first Chinese non-governmental organisation for body donations, Friends of Voluntary Body Donors (FVBD), which is affiliated to the Nanjing Red Cross Society, was established in 1997 in Nanjing. The FVBD facilitates all voluntary whole-body donations in Nanjing. It plays a key role in advocating for and consulting with body donation programmes, as well as contacting and registering new donors. Medical schools in Nanjing have also been working as body donation receiving stations to cooperate with its work. In the early twenty-first century, the number of bodies donated to NMU remained static at 20–30 per year. Since then, significant progress has been made with the support and effort of the Nanjing Red Cross, medical schools and increasing social goodwill support. The present annual donation number has reached about 200 at NMU. The number of donated bodies in Nanjing has nearly met the teaching demand of medical schools in the city. From 1995 until the end of December 2019, a total of 11 163 new donors had registered, and 2146 donations had been made in Nanjing.

To promote the development of body donation programmes, Chinese scholars are constantly exploring various factors that affect body donation in China. At present, most of China's research in this field is limited to 'factors negatively affecting people's willingness to donate', such as inadequate laws, poor social recognition, traditional cultural norms and complex donation processes.^{12–15} However, these factors have been discussed at length and there are no short-term solutions that can be implemented based on our understanding of them. Our recent study demonstrated that conducting

commemorations and improving postdonation services can promote the establishment of successful donor programmes in China, as well as improve the social acceptance of body donation.⁷ Several scholars in developed countries have undertaken research on the demographic factors of donors and their motivations for body donation; they found that altruistic, self-interest and personality trait factors play key roles in the decision to donate.^{16 17} In the Chinese context, however, there remains a lack of relevant research on how donors' motivations contribute to their voluntary donations. To address this gap, this study focuses on donors' motivations to determine the subjective reasons why people donate.

We chose Nanjing as the research site for two reasons. First, Nanjing has a large number of successful donations and can provide enough samples for research.¹⁴ In 2019, for example, 203 people registered as whole-body donors in the city, and 216 donations were made. Second, Nanjing has a relatively good donation culture and the public does not have strong reservations against the topic of donation. Therefore, the interviewees' compliance is better and the answers obtained during the study are highly credible.

This study investigated the donors' demographic characteristics and explored the results of in-depth interviews with volunteers to determine their motivations. It analysed and explored the main decisive factors that influence people's decisions to donate their bodies from both subjective and objective perspectives. Our results suggest ways forward for improving body donation programmes in China.

METHODS

Survey subjects

1. A total of 835 whole-body donors who have donated their bodies to NMU between 1 July 2009 and 30 June 2019. The data were provided by the Nanjing Red Cross Digital Management System for Body Donation.
2. In total, 68 interviewees who were registered as whole-body donors were selected from the 11 administrative districts of Nanjing between June 2017 and July 2019. We strove to select participants from across a varied of education levels, occupations and urban and rural locations to the most possible extent.

The inclusion criteria were as follows:

- a. Having registered at the receiving station of NMU by July 2019.
- b. Being able to communicate well.
- c. Participating in the study voluntarily and willing to cooperate.

The exclusion criteria were as follows:

- a. Unable to fulfil the inclusion criteria.
- b. Unable to provide written informed consent.

Survey methods

We conducted a demographic analysis of deceased donors and in-depth interviews with living donor volunteers. We

have provided the ethical approval statement and interviewees' consent forms to the journal.

Data collection

A registered donor information sheet (with details provided at the time of death) was exported from the 'Nanjing Red Cross Digital Management System for Body Donation'; this included complete sets of donors' data, such as name, sex, age, address, telephone number, education level, occupation, title and cause of death. Data about the consigner (the legal next of kin who is responsible for carrying out the donor's wishes), such as name, address and phone number, were also added. For ethical reasons, the study hid the subjects' names, the consigners' names, their addresses and other personal information. Cause of death was provided by the donors' kin or according to hospital diagnosis. These causes were analysed and subdivided into the cancer, heart disease, cerebrovascular accident, respiratory disease (except tumours), digestive system disease (except tumours), trauma and infectious disease, others and unknown. Thereafter, we carried out a statistical analysis of the data.

In-depth interview

The survey of living donors took the form of an in-depth, semi-structured interview, conducted face-to-face in interviewees' houses. All of the interviewers were drawn from the students' association responsible for body donation matters at NMU. Before commencing the surveys, they were given further training by senior professors specialising in anatomy and doctor-patient communication. Interviewers wore red uniforms that read 'Volunteer of Nanjing Medical University', and they explained the purpose of the study, the interview process and how participant data would be used. Written consent was obtained from each interviewee who agreed to participate. Each interview lasted 30–60 min, and was documented using written notes, audio recordings and photographs. Donors' motivations for donating were also analysed after the interview. To protect the interviewees' privacy, the study omitted their names during analysis and replaced them with numbers (eg, D1, D2, D3, ..., D68).

The survey items and motivation categories were formulated by the researchers based on a literature review^{16–18} and their expert knowledge of the Chinese context. Thereafter, two professors of anatomy performed a blind evaluation of the interview questions. In total, the interview comprised 18 open-ended questions, which were divided into three parts. The first part investigated the demographic data of the participants, such as gender, age, occupation, education level and the age at which they registered as a body donor. The second part focused on the participants' donation motivation, including open-ended questions such as 'Why did you decide to donate your body?' and 'What influenced you to decide to donate?' The third part evaluated the participants' knowledge and understanding of the donation programme. The English

translation of the interview questions is available in the online supplementary file 1.

Data analysis

We analysed the enumeration data by using R statistical software V.3.5.1 for Windows (R Development Core Team, Vienna, Austria) for X^2 . All tests were two-sided, and p values < 0.05 were considered statistically significant. We use thematic analysis to assess interview questions (motivation for donating) following previously published methods.^{17 19}

Patient and public involvement

This study did not involve patients and the public in setting the research question or developing plans for the design or implementation of the study. There are no specific plans to disseminate the results of the research to study participants.

RESULTS

Demographic data of deceased donors

During the 10 years from 1 July 2009 to 30 June 2019, the Body Donation Receiving Station of NMU received a total of 835 donated bodies. The demographic data analysis demonstrated that, of the 835 donors, 66.9% were male and 33.1% were female. The X^2 test results demonstrated that the percentage of male donors to the station was significantly higher than that of the general male population of Nanjing ($p < 0.001$) (table 1).

We analysed a total of 835 donor registration ages, and categorised them into three groups—7 aged under 14 years, 539 aged between 15 and 64 and 289 aged over 65. The registration ages of the donors were remarkably older than those of the general Nanjing population. Statistically, the population of groups aged above 65 years was significantly higher than that of the general Nanjing population ($p < 0.001$) (table 1).

Regarding occupations, 34.0% of the donors worked as labourers, 20.8% as teachers, 13.9% as government officials, 11.3% as entrepreneurs, 9.7% as engineers, 4.7% as medical staff, 1.1% as farmers and 4.6% had other occupations. Statistical analysis showed that the teacher, government official, medical staff and farmer groups formed a significantly larger proportion compared with those from the general population of Nanjing ($p < 0.001$) (table 1).

Concerning cause of death, cancer accounted for 44.3% of the total causes, heart disease for 17.3%, cerebrovascular accidents for 11.1%, respiratory disease for 8.9%, digestive system disease for 2.5% and trauma and infectious disease for 4.0%. Other and unknown diseases made up the remaining 9.6% (table 2).

Regarding the education levels of whole-body donors, 7.8% of the donors had an education level of elementary school or below, and 28.9%, 21.4% and 41.9% had educational levels of junior high school, high school (technical

Table 1 Demographic characteristics of deceased body donors (n=835)

Variable	Number in NMU	Percentage in NMU (%)	Percentage in Nanjing*	P value
Gender				
Male	559	66.9	49.8	<0.001
Female	276	33.1	50.2	
Age (years at registration)				
≤14	7	0.8	11.2	<0.001
15–64	539	64.6	76.4	<0.001
≥65	289	34.6	12.5	<0.001
Occupation				
Labourers	284	34.0	44.3	<0.001
Teachers	174	20.8	7.2	<0.001
Government officials	116	13.9	4.7	<0.001
Entrepreneurs	94	11.3	19.0	<0.001
Engineers	81	9.7	12.5	0.01445
Medical staff	39	4.7	3.4	0.04276
Farmers	9	1.1	0.1	<0.001
Other	38	4.6	8.8	<0.001

*Demographic data of the general population of Nanjing are collected from the Nanjing Municipal Bureau of Population Statistics (2017–2018).
NMU, Nanjing Medical University.

secondary school), and college or above, respectively (figure 1).

This study also analysed the interval between registration and donation (the time from donors' registration to their death) and found that the time range distributed from 0 to 23 years. The median interval is 4 years, and mean value of the interval is 5.8 years. The 0-year group was 238 (28.5%), the most common, which meant that the donors applied to donate their body less than a year before their death. The total number of donors with an interval of less than 5 years was 440 (52.7%), and the number greater than 5 years was 395 (32.7%). We used the X^2 test to analyse the relationship between interval

time and education level, age, gender and occupation, respectively. Results showed that people with an education level of college or above had a longer interval time than other groups ($p=0.010$) (figure 1).

Motivation analysis of living donors

The 68 living donors we interviewed consisted of 38 males and 30 females with an average age of 68.9 years. Among

Table 2 Cause of death among 835 deceased body donors

Cause of death	Number	Percentage (%)
Cancer	370	44.30
Heart disease	144	17.20
Cerebrovascular accident	93	11.10
Respiratory disease (except tumours)	74	8.90
Digestive system disease (except tumours)	21	2.50
Trauma and infectious disease	33	4.00
Others	20	2.40
Unknown	60	7.20

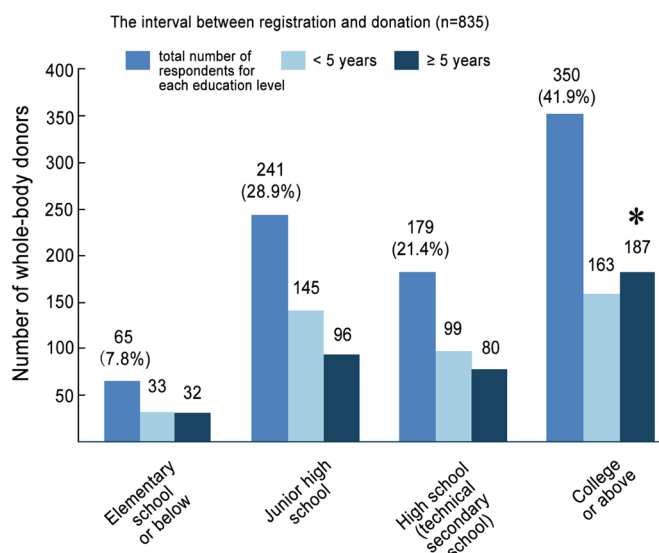


Figure 1 The relationship between education level and the interval between registration and donation. *People with an education level of college or above had a longer interval time than donors in other educational groups ($p=0.010$).

them, 13.2% had an education level of elementary school or below, and 29.4%, 35.3% and 22.1% had educational levels of junior high school, high school (technical secondary school) and college or above, respectively. Regarding occupations, 29.4% of interviewees worked as labourers, 13.2% as teachers, 23.5% as government

officials, 11.8% as entrepreneurs, 8.8% as farmers and 13.2% had other occupations.

The thematic analysis focused on ‘Why did you decide to donate your body?’ Each of these interviewees’ responses comprised both main and secondary themes, and their thematic structure is summarised in [table 3](#). Following

Table 3 Thematic analyses of living donors’ responses to interview questions on motivation to donate (n=68)

Main theme	Secondary theme	Quotes from interview transcripts	Number	Percentage (%)
To support medical education	Shortage of the remains; helping medical students; to contribute to humanity; to contribute to society; to contribute to medical science research; advancement of medical education	‘On the one hand, medical education resources are insufficient, and donating a body can help medical students to better understand the structure of the human body; on the other hand, body donation can allow the best use of the remains and help the society, which is the final contribution that we can make to society’; ‘I realized that without understanding human anatomy, it is impossible to become a good doctor and cure people’; ‘I understood that donation can benefit more people and create greater value, so this idea further strengthened my willingness to donate’; ‘I felt that it was necessary to set an example, so I registered to donate my body’; ‘To make a contribution to humankind’.	48	70.6
To reduce the financial burden of a funeral on one’s children	High funeral costs; high cemetery costs; to not cause problems for future generations; family poverty; reducing the burden on families	‘The money used to buy the cemetery plot can be left to future generations’; ‘I do not want to cause trouble to my children after I die. I want to leave the world in a quiet and dignified manner’; ‘We villagers always need to spend a lot of money to hold a funeral after a death. My household’s financial situation is not good, so I do not want to cause too much of a burden in my children’s future lives. I need to help them save that money’.	36	52.9
No longer holding traditional views of life and death	To be of use even after death; seeing through life and death	‘Turn waste into wealth’; ‘The end of death is the same, which is to be cremated.’	28	41.2
Role model effect	Other donors as role models, and voluntary donors; having relatives or friends registered as donors or become voluntary donors; being moved by the publicity of body donation	‘I first read the story of body donation in the newspaper, and my heart was touched’; ‘My father was a hospital health worker, and my sister worked as a nurse in the hospital. I was influenced by my father when I was young; that is, to avoid a complex funeral after passing away. Everything can just be simple’; ‘I am mainly influenced by my father. I think after people die, their bodies will be of no use, but donating your body can contribute a little to humankind’.	24	35.3
Annoyance at complex funeral ceremonies	Being against complex funerals; lack of relatives (no one to arrange the funeral); time-consuming	‘As the eldest son of my family, I experienced the funeral of my mother. Sending and returning gifts was too complicated’; ‘After the three days leading up to the cremation, four buses of friends and relatives left. I think that such a big funeral is only time-consuming. It is completely unnecessary’.	20	29.4
To be remembered by future generations	Realisation of self-worth; to be remembered by future generations; to be a useful person; to help others	‘I hope to be immortalized in the memorial garden’; ‘achieve self-worth’.	8	11.8
Other	Saving land resources; belief against cremation	‘With the increasing lack of land resources, it is very unrealistic to allow the cemetery to occupy the limited land resources in the future’; ‘As a member of the FVBD, I do not want to waste the country’s land resources’; ‘I don’t want to be cremated immediately after death’.	8	11.8

FVBD, friends of voluntary body donors.

were the main themes: to support medical education; to reduce the financial burden of a funeral on one's children; no longer holding traditional Chinese views of life and death; influence by others ('the role model effect'); annoyance at complex funeral ceremonies; to be remembered by future generations and others.

According to the interview transcripts, most donors did not have only a single motivation; it was a combination of many factors. Our interviews showed that 35.3% of the respondents provided a single donation motivation, and 64.7% of the respondents gave two or more.

Among the 68 respondents, 48 (70.6%) mentioned supporting the development of medical education, which was the largest proportion. The motivation 'to reduce the financial burden of a funeral on one's children' ranked second among all responses, and was chosen by 36 interviewees (52.9% of the total). Furthermore, 28 (41.2%) respondents mentioned that their motivation for donation was 'no longer holding traditional Chinese views of life and death,' and 24 (35.3%) mentioned that their motivation for donation was 'the role model effect'. This means that their decision to donate their body was influenced by others, including relatives, neighbours or other donors reported on by journalists. Of 68 respondents, 20 (29.4%) indicated that 'annoyance at complex funeral ceremonies' was their original motivation to donate their bodies. Further, 11.8% of the respondents mentioned 'to be remembered by future generations' as their motivation. These donors hoped that, in contributing to medicine by donating their bodies, they could 'be immortalized in the donation memorial garden' and 'achieve self-worth.'

DISCUSSION

The Chinese body donation programme has been running for more than 30 years. During this time, although the number of donated cadavers has increased year by year, the demand for cadavers has also grown due to the development of medical education and healthcare. The lack of cadavers remains a serious challenge. The present study investigated body donors' motivations through data analysis and in-depth interviews. Demographic analysis of deceased donors revealed the group that is willing to donate, which is an objective factor. In-depth interviews determined the specific reasons for why registrants are willing to donate their bodies, which is a subjective factor. They two complement each other and constitute important aspects of the influencing factors of donation.

Demographic information

The demographic data revealed that the ages at which donors registered were remarkably higher than those of the general Nanjing population. This finding corresponds with several scholars' reports. For example, a Dutch study on the demographic characteristics of donors reported that 83% of subjects were born before 1950, with a male to female ratio of 49%–51%.¹⁶ Likewise, a New Zealand study showed that the mean age of subjects was 70.5 years, and

of them, 57% identified as female (mean age 69.3 years), while 43% identified as male (mean age 71.5 years).^{17 20} These findings suggest that those contemplating issues around donation are older people. Certainly, most young people rarely think about matters of life and death. It is usually only after middle age that people begin to think more seriously about death and related funeral matters, including the places where their body will be buried. A study in Ohio, in the USA, also confirmed this view; there, donors chose to bequeath their body at or near the time of death rather than when they were young.²¹ Therefore, the focus of promotional work for body donation should be greater on older people, so that it can purposefully promote and improve the efficiency and level of body donations.

This study found that, among the cadavers accepted by NMU during the past 10 years, male donors formed a significantly larger proportion than females. A South African study showed that donors were predominantly male in that country.²² Similarly, in Brazil, the ratio of male to female donation was 2:1.²³ These results indicate that the gender ratios of donors at different registration stations are influenced by cultural traditions in different regions and the gender ratio of the local area.

Age and education level are also relevant factors to consider. An Indian study on body donors found that younger age groups, males, undergraduates and post-graduates were more willing to donate their bodies.²⁴ A study in the USA discovered that respondents with a post-graduate or professional school education had four times the willingness to become whole-body donors than those with lower education levels.²⁵ A Chinese study on brain donors' demographic characteristics also indicated that donors predominantly have higher levels of education.²⁶ The present study found that donors with an education level of college or above accounted for nearly half of the deceased donors in NMU, and that people with a college or higher education qualification will consider body donation earlier. Our results indicate that, among Chinese donors, the higher education group should form the main target group for donation. People with a good education are more accepting of body donation and tend to consider donating their bodies earlier than others. Modern education enables them to forgo traditional and conservative ideas; thus, they are potentially more willing to donate their own bodies and contribute to medical education.

With regard to occupation, our results reveal that donors working as teachers, government officials, medical staff and farmers formed a significantly larger proportion compared with those from the general population of Nanjing. A study in the Netherlands on body donors' occupations showed that 11% of its respondents were educators.¹⁶ Teachers, government officials and medical staff are more likely to be exposed to information about a body donation programme than people in other occupations. Moreover, they have a relatively higher level of literacy and feel a bigger social responsibility to donate

their bodies and contribute to social development. China is a large agricultural country, and its large farming population is the foundation of the party's governance. Farmer groups form a relatively advanced class in Chinese society.

This study shows that cancer and heart diseases are more common causes of death than others. These results roughly concur with a US study, which showed that cardiovascular diseases, cancer and pulmonary dysfunction accounted for the vast majority of all donor deaths.²¹ However, tumours destroy the anatomy of tissue and organs themselves, posing learning problems for medical beginners. At the same time, diseased organs are of great value for clinical research, as they can help clinicians better understand the pathology. For the sake of efficiency, therefore, cadavers should be classified according to cause of death, enabling them to be used for the most suitable research purposes, thereby minimising waste.

Motivation analysis

The results of this study demonstrate that most donors aim to 'support medical education'. An analysis of the motivations showed that cultural norms and social values form the basis of people's motivation to donate. Moreover, people's motivations for donation are often multifaceted and complex. Previous studies on motivation for body donation have shown that supporting medicine or medical education is the primary motivation for people to register as donors.^{16 27 28} These results are consistent with our research. Among our 68 interviewees, 70.6% proposed the core motivation of 'supporting medical education'. Four other main motivations for donation are also dominant: 'to reduce the financial burden of a funeral on one's children', 'the role model effect', 'no longer holding traditional Chinese views of life and death' and 'annoyance at complex funeral ceremonies'. This study divides the motivations for donation into two categories—altruistic factors and self-interest factors—which are discussed below.

Altruistic factors

Three main motivations—'supporting medical education', 'the role model effect' and 'no longer holding traditional Chinese views of life and death' were categorised as altruistic factors in this study.

The core motivation of donors is to support medical education and the development of medical care, including contributing to society. People's donation motivations most often come from their wish to be useful after death. Most donors are ordinary people with higher social value orientation who hope to contribute to society when they die. They wish 'for their death to be worth something meaningful'. These results are generally consistent with those of previous studies.^{27 29 30} Another study on organ donation demonstrated that prosocial behaviour, volunteer work and awareness of needs were significantly associated with being registered as organ donors.³¹

Good role models can subtly change a person's attitude and behaviour, or create a positive atmosphere for body

donation. For this reason, people who have already registered as body donors could become role models to others. A study in the Netherlands found that a great number of spouses or families register together to donate their bodies.¹⁶ Research from New Zealand has also recognised the role of the family and its far-reaching influence on family members' intention to donate or lack thereof.¹⁷ In the present study, more than a third of the respondents referred to 'the role model effect'. It can be inferred that when people around potential donors are donating or supporting medical education for positive reasons, it will be easy for people to be persuaded, impressed and motivated to donate.

From the perspective of culture, western culture or religious faith places a bigger emphasis on self-devotion; thus, it may effectively help promote body donation programmes.^{16 30 32} However, culture and religion play a different role in China and other Asian countries. In Turkey, 3.6% of the population may refuse to donate their body because of their Islamic faith.³³ Hindu religion-based and custom-based barriers are also mentioned in a study relevant to India, which reports that people fear that their donated body will not be treated with respect and dignity, and the belief that the dissection of one's own body is unacceptable.²⁴ South Korea faces similar problems with regard to donation work, as in their religion, it is against one's filial duty to harm one's body, which is given by one's parents.³⁴ In China, traditional Confucian culture is a double-edged sword for donation work.³⁵ On the one hand, it hinders its development: with filial piety as one of its spiritual cores, it maintains that damaging the body is against one's parents' will, and that such an action will break the filial piety rule. In the past, many Chinese citizens held the view that an individual must 'be laid to rest' after death and that 'the body is a gift from the parents and cannot be destroyed'. A recent Chinese survey showed that people without Confucianist beliefs are more willing to donate their bodies than followers of Confucianism.³⁶ On the other hand, Confucian culture emphasises 'benevolence' as the highest criterion of morality. In this sense, donation is a type of dedication to help others that corresponds to Confucius's view of 'benevolence'. People who believe in 'benevolence' choose to donate their bodies to help others rather than maintaining.³⁷ This positive impact can be found in Thailand where the Buddhist faith is the most important factor in the high rate of donor registrations; donation provides the opportunity to create merit for both the donor and their family.³⁸ In modern China, reforms with regard to the forms of funerals (cremation replacing burial) and the impact of western culture have helped people to gradually accept body donation and cadaver dissection. With their views of life and death substantially changed, many modern Chinese people recognise that using cadavers for dissection is less in conflict with traditional beliefs than before. Instead, people now believe that death can also 'turn waste into wealth', thus contributing to medical development.



Self-interest factors

Body donation is more than an altruistic act; it is also an act of self-interest. In this study, 11.8% of the respondents described their motivation 'to be remembered by future generations'. They hoped that their contributions would be recognised by society, and that they would be immortal by their presence in the donation memorial garden. This is in line with previous studies that found that the motivation for donation is both a type of altruistic behaviour and also partly to benefit the donor.^{16 39}

We consider 'to reduce the financial burden of a funeral on one's children' and 'annoyance at complex funeral ceremonies' as self-interest factors. Among donors' motivations, 'to reduce the financial burden of a funeral on one's children' was mentioned second only to 'supporting medical education', which is quite different from the findings of research on people in the West. Very few people in the West donate for the benefit of their children, although this motivation has been suggested.^{16 17} In Chinese culture, however, the life of every family member revolves around the home, and most Chinese parents love their children selflessly while always trying their best to help them. The funeral is an occasion for the living to pay their final respects and twice daily farewell to the deceased. It is obvious that deceased are not at the centre of funerals, which are in fact an occasion for the living to satisfied the need of society and expectations of friends and family.⁴⁰ Filial piety is an important issue in Confucianism as well as an essential element of Chinese culture. The Chinese culture emphasises paying careful attention to the dead's funeral rites and honouring them, and the Chinese tend to organise large funerals for their parents and family members. The major driving force behind expensive funerals in China is the same as everywhere else—tradition. Furthermore, people are likely to pay attention to the social status of the family and even the location of the grave site, which shows filial piety. Consequently, they do not want to impose any financial burdens, such as complex funerals, on their children. In China, death is seen as the final stage of life, and thus the funeral is always grand, which causes a significant financial and spiritual burden for the children of the deceased. Therefore, it is reasonable for Chinese donors to mention wishing to reduce their children's funeral burden as a motivation.

Moreover, Chinese traditional funeral rituals are cumbersome. In the countryside especially, most funeral rites are time-consuming, and extravagant, arranged to show off children's 'good filial piety' rather than true respect for the parents. Many international studies have reported that some donors disapprove of funeral rituals, describing these as hypocritical and an opportunity for financial gain.^{16 17 30} In this study, 29.4% of the respondents mentioned their motivation as being 'annoyance at complex funeral ceremonies'. This is very similar to the results from international studies.

Drawing on our motivational analysis, we identified several measures that may help convince people to

register as body donors. For potential donors, governments should focus on propagating the message that donated bodies can help in producing excellent medical professionals and clinicians, and can thus promote the development of medical knowledge. Among donors' motivations, 'to reduce the financial burden of a funeral on one's children' is an effective conviction for donation work particularly in China. In this regard, body donation receiving stations can improve their facilities to facilitate a more pleasant farewell to the donor; for example, they can provide special cemeteries for burying donors' ashes, and improve the conditions of rooms in which bodies are stored. Such measures can save funeral and cemetery costs, and increase the willingness of donors and their children to donate. People's changing attitudes towards traditional Chinese views on life and death are also greatly benefiting the growth of donation work. The Chinese government can further publicise the value of body donation through the media and thus popularise awareness of body and organ donation, related donation procedures and the use of cadavers and organs. This will help the public to better understand donation work and thus change their attitudes towards donation. Moreover, student volunteer teams from medical schools can canvass in residential areas, business areas, town centres and rural areas. Whole-body donors and their families can also advise others by talking about their own experiences, thus improving awareness of donation work.

LIMITATIONS

The limitations of this study should be mentioned. First, China is a multiethnic country with regional differences in terms of its economics, culture and religious beliefs. Nanjing, where the survey was conducted, is an economically and educationally well-developed city in eastern China. Its population is mostly composed of Han people. The general public in this area has a relatively higher level of cultural and ideological consciousness compared with the populations of other areas. Thus, for further research, survey subjects will be selected from different parts of China in order to create a more extensive sample that better reflects the situation of body donation in China and people's donation motivation. Second, the samples for the in-depth interviews were 68 registered living donors; these may not be representative of the total donors being studied. It is essential that, in future studies, the samples be selected more widely to minimise the selection bias.

CONCLUSION

China's body donation programme has far to go before the demands of medical education are met. This study explored the demographic characteristics of donors in Nanjing and their motivations for donating. We found that males, older people, those with an education level of college and above, and those working as teachers,

government officials, medical staff and farmers are the main donor groups. Chinese social and cultural concepts and values form the basis of people's decisions to donate, but multiple underlying motivations are often at work. Taking these motivations and their relative weighting into account, this study has suggested practical measures that can be taken for the improvement of body donation programmes in China. These include improving facilities at donation stations, and tailoring promotional messaging to stress the various benefits of donation, such as medical education, or reduced financial burdens on donors' children. In this way, the study provides a reference for those seeking to promote their development.

Author affiliations

¹School of Pediatrics, Nanjing Medical University, Nanjing, Jiangsu, China

²School of Public Health, Nanjing Medical University, Nanjing, Jiangsu, China

³School of Basic Medical Sciences, Nanjing Medical University, Nanjing, Jiangsu, China

⁴Research Center of Doctor-Patient Communication, Nanjing Medical University, Nanjing, Jiangsu, China

⁵Body Donation Receiving Station, Nanjing Medical University, Nanjing, Jiangsu, China

Acknowledgements We would like to thank all participants who provided us with their time and information.

Contributors JJ and MZ were responsible for the interpretation of results and manuscript editing. HM and YY collected the information. XC conducted the data analysis. LY, CS and JW devised the study. LZ designed the study and contributed to the analysis. All authors read and approved the final manuscript.

Funding This work was supported by i) Undergraduate Innovation and Enterprise Training Project of Jiangsu Provincial Universities, People's Republic of China (Grant number: 201810312034Y); ii) Educational Reform Project of Nanjing Medical University, Nanjing, People's Republic of China (Grant number: 2019L×007); iii) Qinglan Project of Jiangsu Provincial Universities, People's Republic of China (2018); iv) Course Ideological and Teacher's Morality Project of Nanjing Medical University, Nanjing, People's Republic of China (Grant number: KCSZ2019003).

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Patient consent for publication Obtained.

Ethics approval Ethical approval was obtained from the Ethical Committee of Nanjing Medical University (25 January 2015, Number 2016-389). All participants provided informed written consent prior to their participation in the study.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. All data relevant to the study are included in the article or uploaded as supplementary information. Donors' data that support the findings of this study are available from 'Nanjing Red Cross Digital Management System for Body Donation' but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Nanjing Red Cross. The interview data used and analysed during the current study are available from the corresponding author on reasonable request.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Luqing Zhang <http://orcid.org/0000-0001-7044-0616>

REFERENCES

- Ghosh SK. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. *Anat Sci Educ* 2017;10:286–99.
- Delmas V. [Donation of bodies to science]. *Bull Acad Natl Med* 2001;185:849–56.
- Korf H-W, Wicht H, Snipes RL, et al. The dissection course - necessary and indispensable for teaching anatomy to medical students. *Ann Anat* 2008;190:16–22.
- Anteby M, Hyman M. Entrepreneurial ventures and whole-body donations: a regional perspective from the United States. *Soc Sci Med* 2008;66:963–9.
- Green C, Bowden D, Molony D, et al. Attitudes of the medical profession to whole body and organ donation. *Surgeon* 2014;12:73–7.
- Habicht JL, Kiessling C, Winkelmann A. Bodies for anatomy education in medical schools: an overview of the sources of cadavers worldwide. *Acad Med* 2018;93:1293–300.
- Jiang J, Chen Q, Zhang M, et al. Effects of commemorations and postdonation services on public willingness to donate bodies in China. *Anat Sci Educ* 2020;13:218–29.
- Chen D, Zhang Q, Deng J, et al. A shortage of cadavers: the predicament of regional anatomy education in mainland China. *Anat Sci Educ* 2018;11:397–402.
- Sullivan LW, Chanoff D. *Breaking ground: my life in medicine*. 121. University of Georgia Press, 2014.
- Deng X, Zhou G, Xiao B, et al. Effectiveness evaluation of digital virtual simulation application in teaching of gross anatomy. *Ann Anat* 2018;218:276–82.
- Hu M, Wattchow D, de Fontgalland D. From ancient to avant-garde: a review of traditional and modern multimodal approaches to surgical anatomy education. *ANZ J Surg* 2018;88:146–51.
- Ge W, Guo C, Miao Q. Investigation of the willingness to body donation and its influencing factors among citizens in Hangzhou. *Med Philos A* 2019;40:43–6.
- Xu D, Gao S, SD, et al. Investigation of the body donation will in the southwest of China. *Chin J Anat* 2019;42:106–8.
- Zhang L, Xiao M, Gu M, et al. An overview of the roles and responsibilities of Chinese medical colleges in body donation programs. *Anat Sci Educ* 2014;7:312–20.
- Zhang H, Ma C. Body donation in Beijing, China in the last 20 years: current status and future development. *Anat Sci Educ* 2020;13:272–3.
- Bolt S, Venbrux E, Eisinger R, et al. Motivation for body donation to science: more than an altruistic act. *Ann Anat* 2010;192:70–4.
- Cornwall J, Poppelwell Z, McManus R. "Why did you really do it?" A mixed-method analysis of the factors underpinning motivations to register as a body donor. *Anat Sci Educ* 2018;11:623–31.
- Gürses İlke Ali, Ertaş A, Gürtekin B, et al. Profile and motivations of registered whole-body donors in turkey: Istanbul University experience. *Anat Sci Educ* 2019;12:370–85.
- Harper DJ, Timmons C. How is paranoia experienced in a student population? a qualitative study of students scoring highly on a paranoia measure. *Psychol Psychother* 2019;46.
- Asad AL, Anteby M, Garip F. Who donates their bodies to science? the combined role of gender and migration status among California whole-body donors. *Soc Sci Med* 2014;106:53–8.
- Dluzen DE, Brammer CM, Bernard JC, et al. Survey of cadaveric donors to a body donation program: 1978–1993. *Clin Anat* 1996;9:183–92.
- Labuschagne BC, Mathey B. Cadaver profile at university of stellenbosch medical school, South Africa, 1956–1996. *Clin Anat* 2000;13:88–93.
- da Rocha AO, de Campos D, Farina MA, et al. Using body donor demographics to assist the implementation of donation programs in Brazil. *Anat Sci Educ* 2017;10:475–86.
- Rokade SA, Gaikawad AP. Body donation in India: social awareness, willingness, and associated factors. *Anat Sci Educ* 2012;5:83–9.
- Boulware LE, Ratner LE, Cooper LA, et al. Whole body donation for medical science: a population-based study. *Clin Anat* 2004;17:570–7.
- Zhang H, Chen K, Wang N, et al. Analysis of brain donors' demographic and medical characteristics to facilitate the construction of a human brain bank in China. *J Alzheimers Dis* 2018;66:1245–54.
- Cornwall J, Perry GF, Louw G, et al. Who donates their body to science? an international, multicenter, prospective study. *Anat Sci Educ* 2012;5:208–16.
- McClea K, Stringer MD. The profile of body donors at the Otago school of medical sciences-has it changed? *N Z Med J* 2010;123:9–17.



- 29 Fennell S, Jones DG. The bequest of human bodies for dissection: a case study in the Otago medical school. *N Z Med J* 1992;105:472–4.
- 30 Richardson R, Hurwitz B. Donors' attitudes towards body donation for dissection. *Lancet* 1995;346:277–9.
- 31 Merz E-M, van den Hurk K, de Kort WLAM, *et al.* Organ donation registration and decision-making among current blood donors in the Netherlands. *Prog Transplant* 2017;27:266–72.
- 32 Ajita R, Singh YI. Body donation and its relevance in anatomy learning: a review. *J Anat Soc India* 2007;56:44–7.
- 33 Sehirli US, Saka E, Sarikaya O. Attitudes of Turkish anatomists toward cadaver donation. *Clin Anat* 2004;17:677–81.
- 34 Park J-T, Jang Y, Park MS, *et al.* The trend of body donation for education based on Korean social and religious culture. *Anat Sci Educ* 2011;4:33–8.
- 35 Jones DG, Nie J-B. Does Confucianism allow for body donation? *Anat Sci Educ* 2018;11:525–31.
- 36 Zhang Q, Deng J, Yan C, *et al.* Who is willing to donate their bodies in China? perceptions, attitudes and influencing factors among citizens of Changsha. *Ann Anat* 2020;229:151483.
- 37 Chiu HY, Ng KS, Ma SK, *et al.* Voices of donors: case reports of body donation in Hong Kong. *Anat Sci Educ* 2012;5:295–300.
- 38 Techataweewan N, Panthongviriyakul C, Toomsan Y, *et al.* Human body donation in Thailand: donors at Khon Kaen university. *Ann Anat* 2018;216:142–51.
- 39 Gunderman RB. Giving ourselves: the ethics of anatomical donation. *Anat Sci Educ* 2008;1:217–9.
- 40 Xia H. On the traditional culture of filial piety. *Confucian Acad* 2017;4.