VILNIUS UNIVERSITY

FACULTY OF MEDICINE

Medicine

Department of Anatomy, Histology and Anthropology of the Faculty of Medicine of Vilnius University

Benedikt Hegele, 2025, Group 3

INTEGRATED STUDY MASTER'S THESIS

Nuo altruizmo iki anatomijos: Vilniaus universiteto kūno donorų registro analizė

From Altruism to Anatomy: an Analysis of Vilnius University's Body Donor Register

Supervisor Andrej Suchomlinov , PhD. Associate professor, Institute of Biomedical Sciences, Department of Anatomy, Histology and Anthropology

Head of the Department of Anatomy, Histology and Anthropology of the Faculty: Prof. Janina Tutkuvienė, PhD

Vilnius 2025

Benedikt.hegele@mf.stud.vu.lt

Summary

Learning human Anatomy not only from textbooks and images but also through practical experience with real human bodies, is an essential part of every medical student's education. To do this, altruistic people choose during their lifetime to donate their bodies for educational purposes. Following this decision and signing an informed consent form, they get registered in the “Vilnius University Body Donors Database” . The database was established with the first registered donor in 1999 and has continued to grow ever since.

As of the most recent update on December 31th 2024, the database included 459 registered donors, with the majority (62%) being female.Typically, individuals decide to donate at an average age of 65, with men making this decision at an average age of 63 and women slightly later at 66.
The average age at death is 73 for male donors and 77 for female donors. Currently, the database lists 70 donors who are already diseased, most of whom have been cremated and buried.

At the time of the data analysis, 21 bodies were in use at Vilnius University. Notably, 60,2% of all donors opted to donate their bodies for an unlimited period of time.
The number of newly registered donors peaked in 2019, followed by a decline until 2021. Since then, registration numbers have steadily increased,reaching a record high of 71 new registrations in 2024.

The region with the highest body donors in terms of total numbers is the municipality of Vilnius city, with 214 donors in total, representing 47,7% of all registered donors of Vilnius University. However, when considering the number of donors per 100.000 inhabitants, the municipality of Anykščiai has the highest rate, with 51,3 donors.

To get a better overview over these donors, this study's aims to analyze the database and extract information that could be utilized by Vilnius University in the future.

Keywords

Body donation, Vilnius University Body Donor Database, Vilnius University Faculty of Medicine

1. Introduction

Body donation means to give one's body, with full consent, to be used for medical research and education. (1) This is not a new concept, and the way bodies are sourced for said research and education, can differ greatly between countries. A lot of countries have already established well working body donation programs; others depend mainly on using unclaimed bodies, as they do not have body donation programs yet. Some countries do not use bodies at all in teaching and research, as it is unthinkable in regards to their cultural or religious beliefs. (2) Where the human tissue that gets used comes from is mainly dependent on laws present in the individual country, the education of the population on the topic and their desire to participate in a contribution to science, as well as socioeconomic factors, religious, and cultural beliefs. (3)

Working with actual human bodies during medical studies, like in dissection classes during anatomy studies, can be crucial in practicing manual skills later needed to practice surgery. It is also generally known that obtaining knowledge passively via reading, hearing, or observing is inferior in quality to the active learning strategy, where students learn via discussing, touching, and dissecting. (2)

Possible motivation for the donation of one's body for the purpose of education and research can be found in previous papers. It shows that medical professionals and those involved in teaching seem to be more open to body donation. Motivations include being useful for medical science after death, aversions regarding funerals, and gratitude expression. Money concerns and loneliness do not seem to have as big an impact as previously thought. (2) Religion seems to be a big factor against donation, and many donors have no religious connections. (2)

Ethics need to be considered as well when talking about body donation. One major ethical problem that is associated with body donation is the use of unclaimed bodies. This was stopped by the International Federation of Associations of Anatomists in 2012. (4) But some countries still depend on the practice. (3) Here, the main concern is the use of bodies of people who were unable to give their consent, especially the poor and the mentally ill. (4) Other ethical concerns include the cutting into dead human bodies, which could be seen as a violation of the body. This is seen as taboo in many cultures. Here, the law is the biggest protecting factor. The humanistic approach tries to help

here as well by turning the traditional view of the body used from a cadaver or specimen to the "body of the donor" and a human with human rights. (5)

With universities and medical schools increasing in size, a lot of these institutions are experiencing difficulties in getting enough donors for their teaching practices. (1) Vilnius University is also constantly trying to enlarge its donor base and get new possible donors through education and raising awareness. (6)

The issue of body donation has been concerning Vilnius University and the Republic of Lithuania for years now. Until the year of 1998, unclaimed bodies were used for medical study purposes at the Vilnius University. In 1999, the Vilnius University body donor registry was established, and when in 2007 the law of burial of human remains was passed, and it was no longer legal to use any other bodies, than bodies obtained through voluntary body donation, the University was fully dependent on its body donor registry. (6)

The Faculty of Medicine is mainly responsible for the issue of body donation for Vilnius University. They raise awareness and spread information on the topic through the media. The registration process can be done via phone, email, postal mail, or in person at the department itself. Documents required for the registration as a body donor at the medical faculty of Vilnius University include a declaration of will and the decision on the embalming process and the handling of the remains after passing. After an educational discussion, the decision is then finalised at a notaries office with the official signing of the declaration of the donors will. (6)

Previously, the medical faculty experienced some legal issues and confusions, which is why in 2008 a prefabricated form for the declaration of will was established to give a structured legal framework for the donation. This form has a section for the donors personal wishes, which leaves a lot of room for individual interpretations of how the donors wish the donation process to be. In the future, a specialised body donor identity card is planned to be handed out to Vilnius University donors. (6)

In the article by Brenner et al. (2024), written on this topic, Prof. Janina Tutkuvienė describes the experiences the faculty had with negative articles and unethical reporting as preventing people from registering as body donors. But if articles are objective and written appropriately, the University has experienced a positive impact. (6)

The bodies are handled by the Department of Anatomy, Histology, and Anthropology at the Faculty of Medicine. It is responsible for the preparation, storage, usage, and later the disposal of the remains. The process after the death is as follows and gets carried out by Anatomists working for Vilnius University. The deceased donor gets transported to the Department by a funeral company, where they get examined for their suitability, then embalmed (or frozen) and stored. No longer than 72 hours has to pass between the moment of death and the body being transported to the Department, sometimes, especially during summer months, this period may be even shorter. The embalming process depends on the intended purpose of the body and could either be done by using formaldehyde, alcohol, phenol or the deep freezing method. The latter method is mainly used for short term donations that consented to one year of usage or post autopsied bodies. Due to the nature of this technique bodies are often used for surgical education. (6)

Problems arising during this time in the donation process are often associated with relatives of the deceased. Sometimes they do not inform the faculty about the death of the relative, or they demand the body back before the intended period of use is over. In a few instances, they wanted to have the funeral in less than a year, which can negatively influence the education process. (6)

All bodies are usually accepted by the medical faculty of Vilnius University. There are some exceptions to this. A body is not accepted if it is already decomposing when found, if the body is severely damaged and can not be used anymore, or if the donor died abroad and the return of the body would take too long. It is also notable that during the COVID-19 Pandemic, the bodies of infected individuals were not accepted. (6)

Payment, for body donations, in any form is forbidden in Lithuania. Nevertheless, the University pays for the cost of handling the body and the donation. This includes: Notary costs, embalming, storage, use, cremation. The costs for the burial and ceremony are compensated for if the donor decides they want the burial and ceremony to be organized by Vilnius University. (6)
The donated bodies are mostly used for medical student education but are also used in residency training or for research in basic and clinical sciences. All usage is always carried out under supervision by licensed anatomists. The declaration of will is honored, and the body is used in the way indicated by the donor. (6)

Previously, burial, cremation, or the preparation of a wet anatomical specimen were possible, but since 2010 all bodies have been cremated after their intended period of use was finished. In the future, the Urns will be buried at a dedicated place in the historic cemetery of Vilnius, to honor

donors. Another tradition to honor donors is already in place. Ceremonies and annual masses are held by Vilnius University, which are attended by relatives of the deceased, students and professors alike. (6)

The biggest problem the Faculty of Medicine of Vilnius University is facing right now is the few bodies that are donated each year. Because of this lack of bodies that can be used for educational purposes, they are still unable to make dissection mandatory in the study process. In the past there was only an optional dissection course available and education is provided additionally through using already prepared bodies and wet specimens, as well as video and online study materials. This lack of human material for studies also impacts residency training, especially in the field of surgery, leading to Lithuanian doctors needing to go to other European countries for their training. (6)

Since the beginning of the database, with the first registered donor on the 2nd of March 1999, the database has rapidly grown. Today the database contains 459 donors. To get a better overview over these donors this study's aims to analyze the database and extract information that could be utilized by Vilnius University in the future.

2.Literature review

The main and only literature that has looked at this topic of body donations specifically in Lithuania and given a few facts regarding the "Vilnius University Body Donor Database" is the article: "The legal and ethical framework governing body donation in Europe – 2nd update on current practice" by Brenner et al., published in 2024. In this article the 14th chapter written by Prof. Janina Tutkuvienė, Head of the Department of Anatomy, Histology, and Anthropology of the Faculty of Medicine at Vilnius University, describes how body donations are currency handled at the Vilnius University. She gives some insights into the numbers of donors and a few demographic facts.
This data analysis was carried out in order to get a deeper understanding of said database. The "Vilnius University Body Donor Database" has not been analyzed to these depths, as done in this analysis, before. The author tried to extract as much demographic information as possible from the source. The Donor program is seeing yearly increase in donations, but these donations are still not enough and do not cover the need for bodies during anatomical classes at the Faculty of Medicine at the Vilnius University.(6)

Brenner et al. did not only look at Lithuania but at 39 countries all over Europe. They found that 18 European countries have national regulations for the process of body donation, and two countries have federal laws regarding it. Some countries accept unclaimed bodies in addition to donated bodies, likely because the country's justice system is lacking the appropriate laws. (6)

Riederer et al. looked at several countries, including the United States of America. Whole body donations have existed in the US for at least 50 years. Because of that, the ethical and legal frameworks are well defined for whole body donation programs. In the US many universities have their own body donation programs. 95,5% of Universities with donation programs hold memorial services for their donors in the US.(2) In addition, the US is one of the few countries that allow for-profit acquisition of bodies. The companies get bodies that are donated to them and then distribute them to medical institutions which need them for education. The receiving institutions are not charged for the bodies themself but need to pay a fee for the handling of the bodies, through which the companies make their profit.(7)

In Thailand, Koen Kaen University is an example for body donation handling. The body donation program was established in 1973, since then only donated bodies were used. It is one of eight Universities in Thailand that accepts body donations. Thailand does not have legislation controlling body donations, so the program is self regulated. Donor registration is accepted from 18 years old, and only from the Isan region. as it is enough to cover the Universities needs. They have a high rate of registration with more females than males, and name the buddhist faith as the main reason for that. (8)

Jenkin and Keay looked at whole body donation programs in Australia and New Zealand. Australia has 4 programs that act as central mortuaries supplying all users in their state, the rest,, and all programs from New Zealand, work on an institutional level. Across both countries around 1000-1500 donors are received per year. The cremated remains are returned to the families in all cases. Pre-death registration is required by two-third of the programs, and Next-of-kin authorization is always needed for donation. Most of the programs hold memorial ceremonies of some kind. (9)

The data extracted from this data analysis could hopefully be a potential aid in the question on how to solve the problem of body donations to Vilnius University. More research on this topic is needed to find all possible ways to solve the issues the University is facing at the moment.

3.Methods

The majority of the data analyzed in this paper was provided by the Department of Anatomy, Histology and Anthropology of Vilnius University. The main source of information used in this analysis is extracted from the “Vilnius University Body Donor Database” , this registry contains all individuals who decided to donate their bodies to Vilnius University after death. The database does not include any personal information of the donors like their name, surname, or other personal information that could be used to identify any donors.

In addition, a dataset which was created using geographical information from the body donor database and additional demographic data provided by the Lithuanian government was used. It contains information about the 60 municipalities of Lithuania regarding their population, the gender ratio, the age distribution, and the number of donors in each municipality. Both databases were last updated on the 31st of December 2024; this reference date was used consistently for all calculations conducted in this study.

To provide additional context and for the analyzed data and to enable comparison with already available literature, 29 different sources were used. To find the data needed, the two databases Google Scholar and PubMed were used. Articles from roughly the past ten years have been used. Articles had to be written in English or German and be available either to the public or through the library access provided by Vilnius University online library.

A literature search was then conducted that included, but was not limited to, the following keyword searches: Body donation, Body donation motivation, Body donation ethics, Body donations in Lithuania, Body donation ceremonies, Body donation COVID-19, COVID-19 Pandemic, COVID-19 Pandemic limitations, Altruism behavior gender differences, Gender gap in life expectancy, Gender gaps in life expectancy Lithuania, Gender gap in life expectancy causes.

4.Research results

The issue of body donation has been concerning Vilnius University and the Republic of Lithuania for years now. Until 1998, unclaimed bodies were used for medical study purposes at Vilnius University. In 1999, the Vilnius University body donor registry was established, and when in 2007

the Law of Burial of Human Remains was passed and it was no longer legal to use any other bodies than bodies obtained through voluntary body donation, the University was fully dependent on its body donor registry.(6)
Since then, more and more people have decided to donate their bodies after their death to Vilnius University, making it possible for the university to educate future generations of medical students and support them in becoming competent physicians.
To get a better overview of the people who made the decision to donate their bodies to medical science, various statistical analyses and datasets were examined, in order to get more information about the donors of the “Vilnius University Body Donor Database”.

4.1 “Vilnius University Body Donor Database”

The “Vilnius University Body Donor Database” contains records of 459 people. These people decided that after their death they want their body to be donated to Vilnius University. These donations enable the university to conduct scientific research and support practical training of medical professionals and students.

In the following study, the database provided by the “Department of Anatomy, Histology and Anthropology of Vilnius University”, was analyzed for the first time, with different information about the donors being extracted. The last time the database was updated was on the 31st of December 2024; this date was also used for all calculations which are shown later in the text. Of the 459 registered donors, 175 are male and 284 are female. This means that with 38% men and 62% women, nearly two-thirds of all donors are female. Because of data protection, there is only limited information known about each person, and no names are available.

Every donor was assigned a row in an Excel spreadsheet, ranging from row 2 to 460. The first row was reserved for the column headlines, providing different categories of information recorded for each donor. These different categories are written on top of each column.

The first column contains the “date of birth” of every donor. In the second column, the dates when the donors signed the “informed consent” to donate their body are listed. The third column contains the “place of residence” of every donor in the form of the municipality they live at the moment. The next column shows the “date of death”,if the person is still alive, the column is left empty. The next column, “Comments”, is used for additional information about the donors and bodies, for example,

if they withdrew their decision (2 people) or if the body couldn't be received for some reason, such as being found after decay has already set in, if the body was infected, severely damaged, or if death occured in a foreign country where the body could not be transferred to the university in a timely manner.(6) The next column shows the “age at the date of informed consent”. Column “H”, with the title “Cremation”, shows for every donor if they have already been cremated; if the body is not cremated the cell in the Excel-sheet remains empty. The next column, “Urn with ashes”, contains information about what should happen to the ashes of the donors after the cremation. Column “J” contains information about how many years the university is allowed to use the body. The last column,”Mentioning name during the Mess,” has information about the donor's decision on whether they want their name mentioned during the Mess to honor the donors.

To improve the clarity of the database and make it easier to analyse different datasets, filter functions were applied to each column. These filters allow for the extraction of relevant information and exclude unnecessary data. During the analysis of the “Vilnius University Body Donor Database,” additional data about the donors was obtained and added to additional columns for further calculations.

4.1.2 Date of Birth

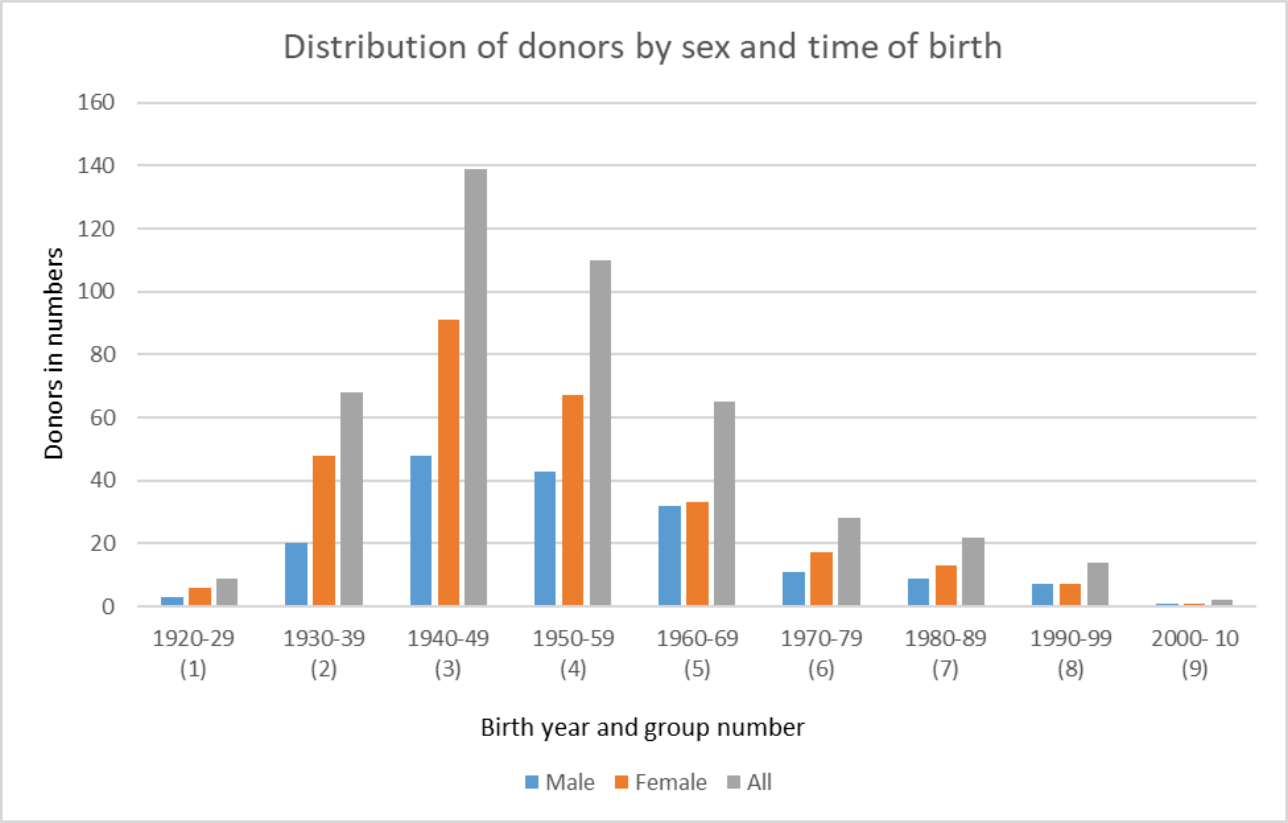
This research started out by taking a closer look at the dates of birth of all donors. Their distribution is illustrated in Figure 1. and will be discussed in more detail in this text. For a better overview of the topic, the donors were divided into nine groups according to their decade of birth, each group containing all donors born in the same ten-year period. For example, group 1 contains all registered donors born between 1920 and 1929.

The earliest birth date recorded in the database belongs to a male donor born in 1921. The most recently registered donor is a female born in 2001.Therefore, Figure 1. covers the birth decades from 1920-1929 through 2000-2009.

The first group includes only three male donors and six female donors, this makes a total of nine donors, leading to it being the second smallest cohort in the database. The second group, comprising those born from 1930 to 1939, has over seven times more donors than the first group. In total, there are 68 donors in this group, 48 females and 20 males, making it the third biggest group in Figure 1. The highest number of donors are in the third group, consisting of people born between the year

1940 and 1949. In this period of time, 141 of the 459 donors were born which is 30,7% of all donors, 28% of all men and 32,4% of all women.

The second largest group is Group 4, which consists of the donors born between 1950 to 1959. With 43 men and 67 women, they make up a total of 110 donors, which is 24% of all donors. Group 3 and 4 combined contain 54,7% of all donors in Vilnius University body donors register. Group 5, born between 1960 to 1969, contains 32 males and 33 females, which makes a total of 65 donors. This means they make up 14.2% of all donors. Groups 6 to 9, spanning from the year 1970 to 2009, combined make up 14% which means all these groups together have fewer donors in total than Group 5 alone. There are a total of 66 donors in these last four groups. The largest of these four groups is the 6th group with 28 donors. The 7th group has 22 donors. The 8th group, which is the group from 1990-1999, has 14 donors which are equally split between seven males and seven females. The smallest group is the 9th, and also the group with the youngest donors, which contains only one male donor and one female donor; together; they represent only 0,4% of all donors. For further analysis of the distribution of the donors across groups, a Shapiro-Wilk test (10) was performed (p-value=0,14875) which indicates the distribution of the donors seen in Figure 1. follows a normal distribution.



(Figure 1. “Distribution of donors by sex and time of birth”)

4.1.3 Date of Informed consent

To better understand the development of body donor registrations over time, an analysis of the dates of informed consent was conducted. This dataset shows how many people got registered and in which year they decided to donate their body to Vilnius University. The earliest recorded decision to donate is from the year 1999, it was made by a male donor.

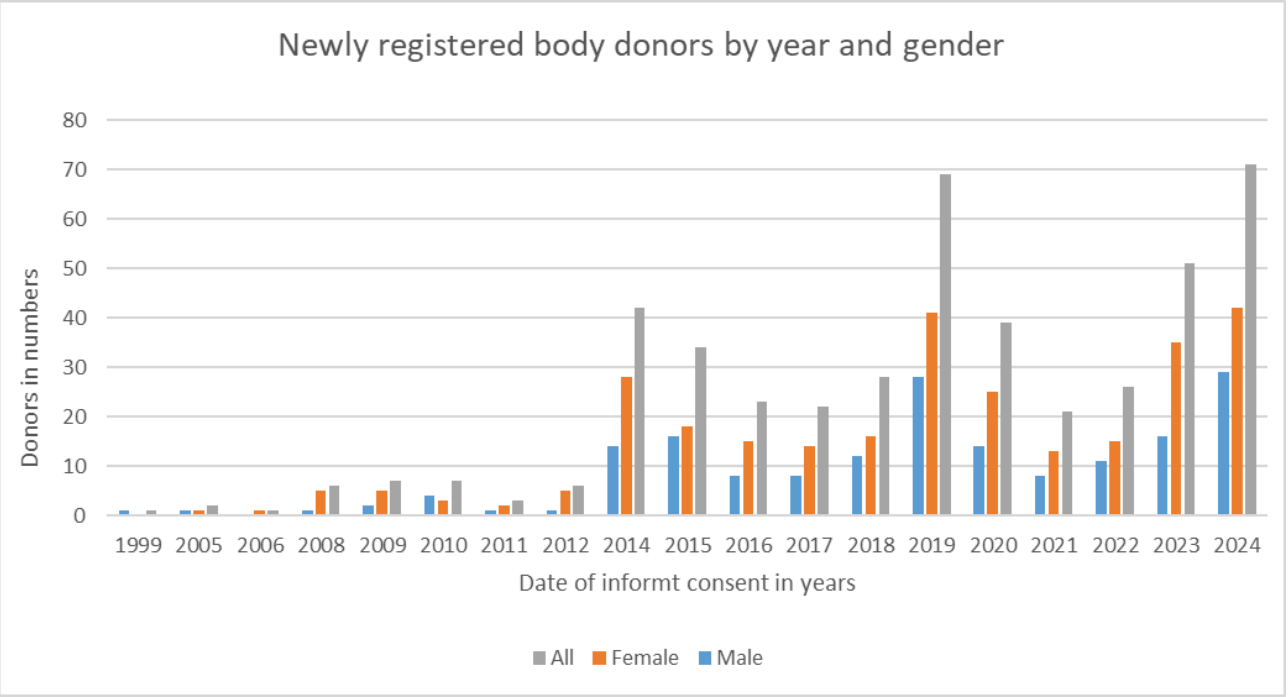
There are no earlier recordings because until 1998 the Vilnius university used unclaimed bodies, mainly from hospitals and nursing homes.(6) In the years 2005 and 2006, a total of three bodies were donated. From 2008 to 2012 the numbers remained relatively stable, with six to seven donations per year. Only in 2011 was there a small decrease, with just 3 bodies donated, as can be seen in Figure 2.
In 2013, no body donations were recorded. However, as shown in Figure 2., a significant increase occurred in the following year. In 2014, a total of 42 people (14 males and 28 females) decided to donate their bodies to Vilnius University, which is more than all donations from 1999 to 2013 combined.

From 2014 to 2017 a steady decrease can be observed (Figure 2.). By the year 2017, the numbers of body donations had decreased to a total of 22 donors, which is, compared to the peak in 2014, half the number of donors. In the following year, 2018, the numbers increased again to a total of 28 donors. This increase can also be seen in the year 2019, which was a new high in the history of the body donors database: with 28 males and 41 females, a total of 69 people decided to donate their body after death in that year. This means that 15% of all donors signed their consent forms in 2019 making it the year with the second highest number of informed consents in the history of “Vilnius University Body Donor Database”.

In the years following 2019, a significant decline in registrations occurred, reaching a low of only 21 donors in 2021, less than one third of the peak number recorded in 2019. From that point forward, as seen in Figure 2., a steady upward trend can be seen, continuing through to the end of 2024.

Therefore, the latest numbers from the database show a historical peak: with 29 male and 42 females, a total of 71 people decided to sign the informed consent in the last year. This means that,

with 15,5% of all donors who signed the papers in 2024, there is a slight increase compared to the last peak in the year 2019. Compared to the previous peak in 2019, it can be observed that the male-to-female ratio remains roughly the same. In all years, it can be seen that more women than men sign the papers to become body donors in general.



(Figure 2. “Newly registered body donors by year and gender”)

4.1.4 Age at the date of informed consent

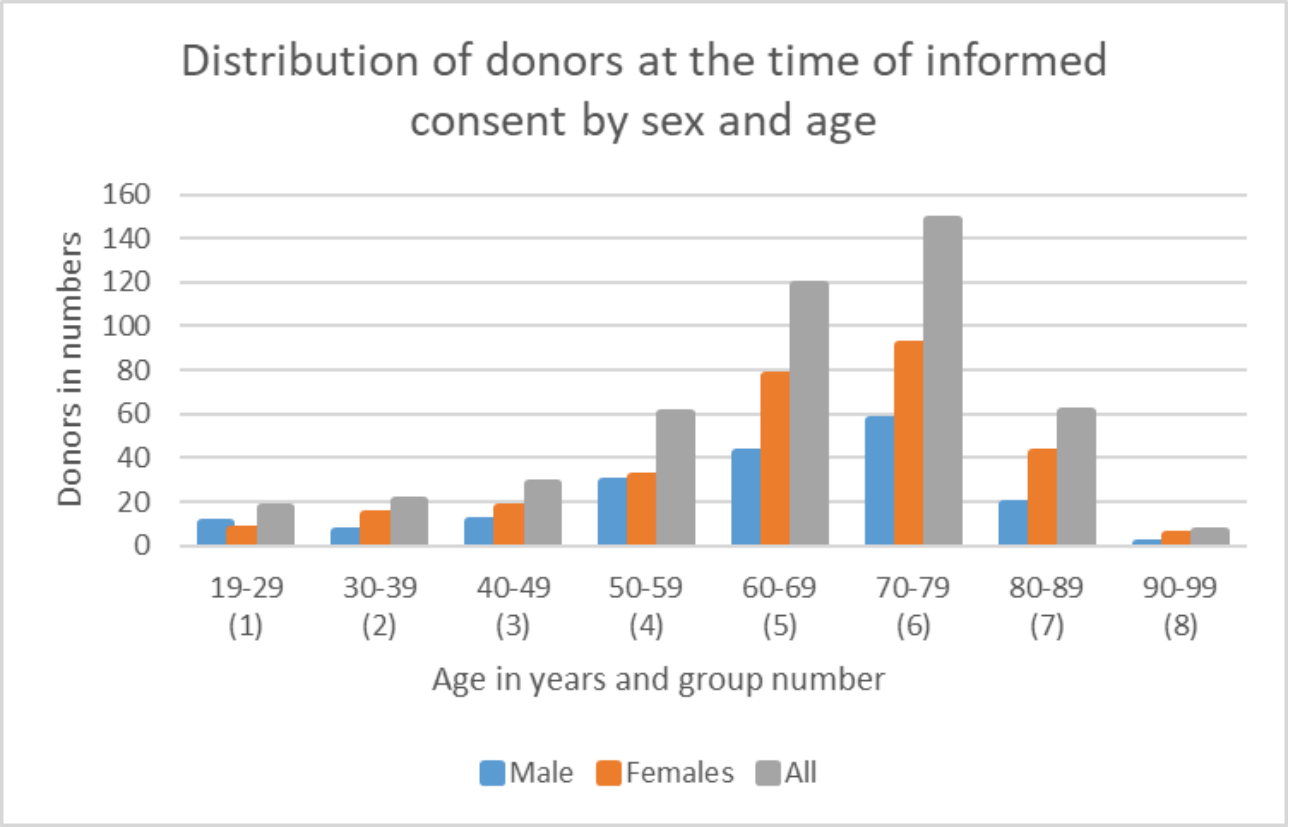
To take a closer look at the age at which the donors consented to body donation and registered themselves as body donors in the “Vilnius University Body Donor Database”, donors were categorized into age groups based on their age at the time of signing the informed consent. The groups were separated in such a way that each group contained one decade of donors.

The first group is the only exception to this, as it contains donors of twelve years, instead of the usual ten years the other groups contain. This made more statistical sense, as the legal age to register as a body donor in Lithuania is 18 years(6). Therefore, the group of people registered between the age of 18 and 19 would be too small, and they were added to the group of 20-29 year-olds. To determine how old the donors were when they signed the papers, and then this value was divided by 365. The resulting age was rounded down to full numbers.

The youngest group contains 10 male and 7 female donors, which makes it the only age group with more male than female donors; this is also visualized in Figure 3. The second group which contains donors from 30 to 39 years of age, consists of a total of 20 donors. From this group of 20 donors, 14 are female and 6 are male. The third group, as seen in Figure 3., displays only a slight increase compared to the second age group, with 28 donors. The fourth group, formed of donors aged 50 to 59 years, has more than twice the number of donors. The group contains a total of 60 donors, which are nearly equally distributed between the genders, with 31 females and 29 males.

The second largest group, according to the age when they signed the consent, is Group 5, containing donors from 60 to 69 years of age. This group has nearly the same number of people as the first four groups combined. In total 119, representing 25,9% of all people registered in the database, signed their papers between the ages of 60 to 69.
As seen in Figure 3., only in the age group from 70-79 did more people make the decision to register their bodies at the “Vilnius University Body Donors Database”. In this group, 57 men and 91 women make up a total of 148 people who want to donate their bodies. As a group, they make up 32,2% of the 459 registered donors.

The 7th group, with donors from 80-89 years, contains 61 donors, nearly the same number as Group four but the distribution between the genders is completely different. With 42 females and 19 males, Group 7 shows a female dominance in comparison to Group 4. The 8th group is the oldest group in terms of age and is also the smallest one, with only 6 people in total, of whom 5 are female and only one is male. After analysing the donors according to their age when they signed the papers, the average age of the donors was calculated, to find out how old the donors are on average when they decide to donate their body. The male donors are on average 63 years old, the female donors are 66 years old. The average age of all donors is 65 years when they signed the papers. Looking at Figure 3., it can be suspected that the age distribution does not follow a curve of normal distribution. To verify this hypothesis, a Shapiro-Wilk test (10) was conducted, which showed a p-value < 0,00001 for both males and females. This means the age at the time of consent does not follow a curve of normal distribution, as already suspected.



(Figure 3. “Distribution of donors at the time of informed consent by sex and age”)

4.1.5 Age Today

Another interesting piece of information that can be acquired from the database is the current age of the donors. To calculate the age of each donor, the date of birth was subtracted from the date on which the database was last updated, December 31, 2024, and the result was divided by 365.The resulting number was then rounded down to a whole number. To exclude donors who are already deceased, the filter settings were adjusted so that every person with a date of death was excluded from the formula. Of the 459 donors, two had previously withdrawn their decision to donate their body and, for one donor, the data is missing. Therefore,these two individuals were excluded from the calculations in this section of the article.

In total, 144 male donors and 242 female donors, making a total of 386, are still alive today. To provide a clearer overview, the individuals were divided into groups according to their age, with each group covering a ten-year age range.

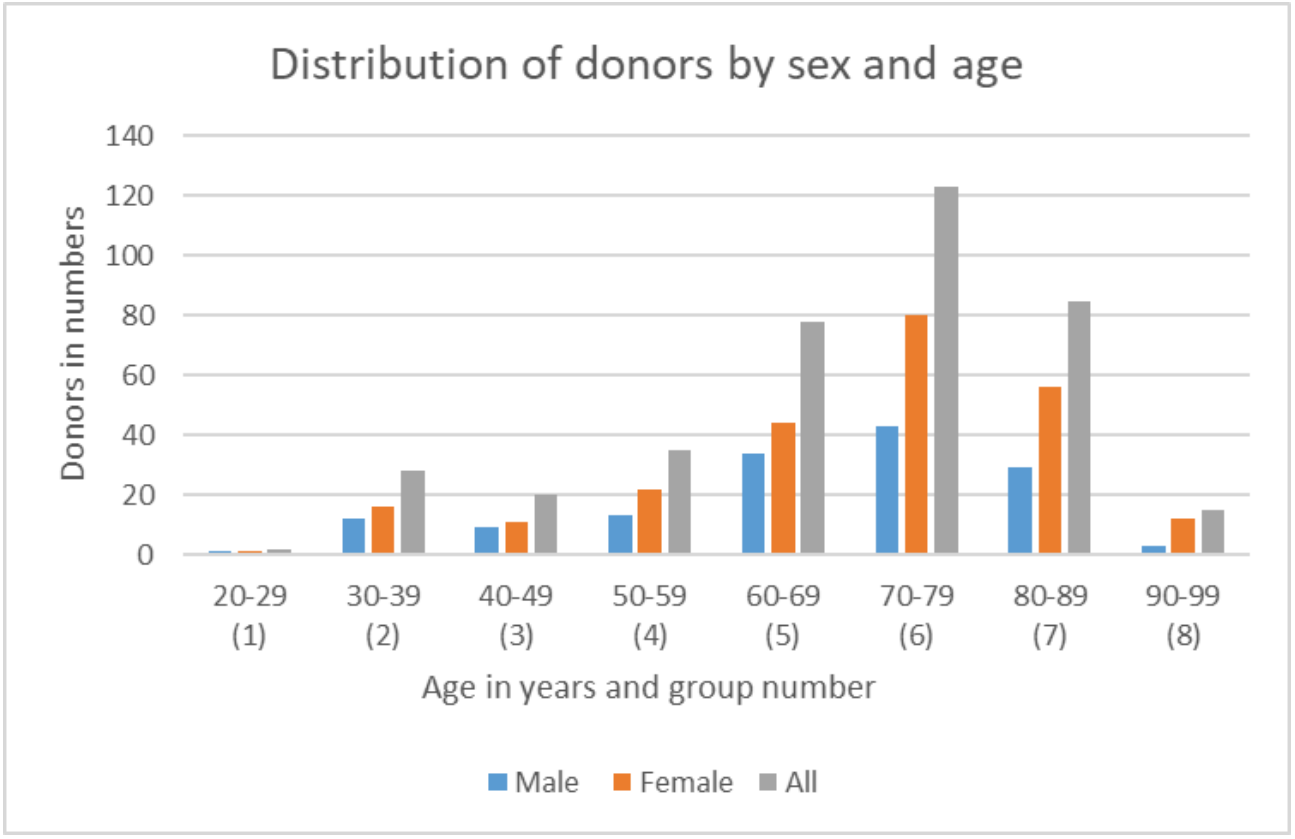
The first group includes donors from the age of twenty to twenty-nine. This group contains only one male and one female donor, making it the smallest group. The second group, with 28 donors between the age of 30 and 39, consists of 12 male donors and 16 female donors. The third group

comprising donors aged 40 to 49, includes 20 individuals in total, and is slightly smaller than the preceding group.

The fourth group containing donors ages 50 to 59, includes 35 individuals, 13 men and 22 women. The fifth group is, with 20,2% the third biggest age group of donors. It includes 78 donors in total. The largest group of donors, as can be seen in Figure 4., is the sixth group. This group contains individuals between the ages of 70 and the age of 79. Here, 43 male donors and 80 female donors are registered, which makes a total of 123 donors. This group totals 31,9% of all living donors, which makes nearly a third of all donors who are alive today. This big group is followed, as seen in Figure 4., by the second biggest group, group 7, with 29 male and 56 female donors. Group 7 is formed of all donors from 80 to 89 years of age. This group makes up 22% of all donors. That means that more than half of the donors in the "Vilnius university body donors database" are between the age of 70 and 89 years old.

This group makes up 31.9% of all living donors, making it the group containing nearly a third of all donors who are alive today.

To get more information about the age distribution of the donors, a Shapiro-Wilk test (10) was performed. The results showed that neither the males ($p = 0{,}00002$) nor the females ($p < 0{,}00001$) followed a curve of normal distribution.



(Figure 4."Distribution of donors by sex and age")

4.1.6 Deceased

Taking a closer look at the database, the filter settings can be adjusted to show a specific subgroup of donors for separate analysis. This subgroup includes all donors in the database who are already deceased and therefore of relevance for further analysis. They, as a group, can be used to show different statistics about their death and the use of their bodies afterwards.

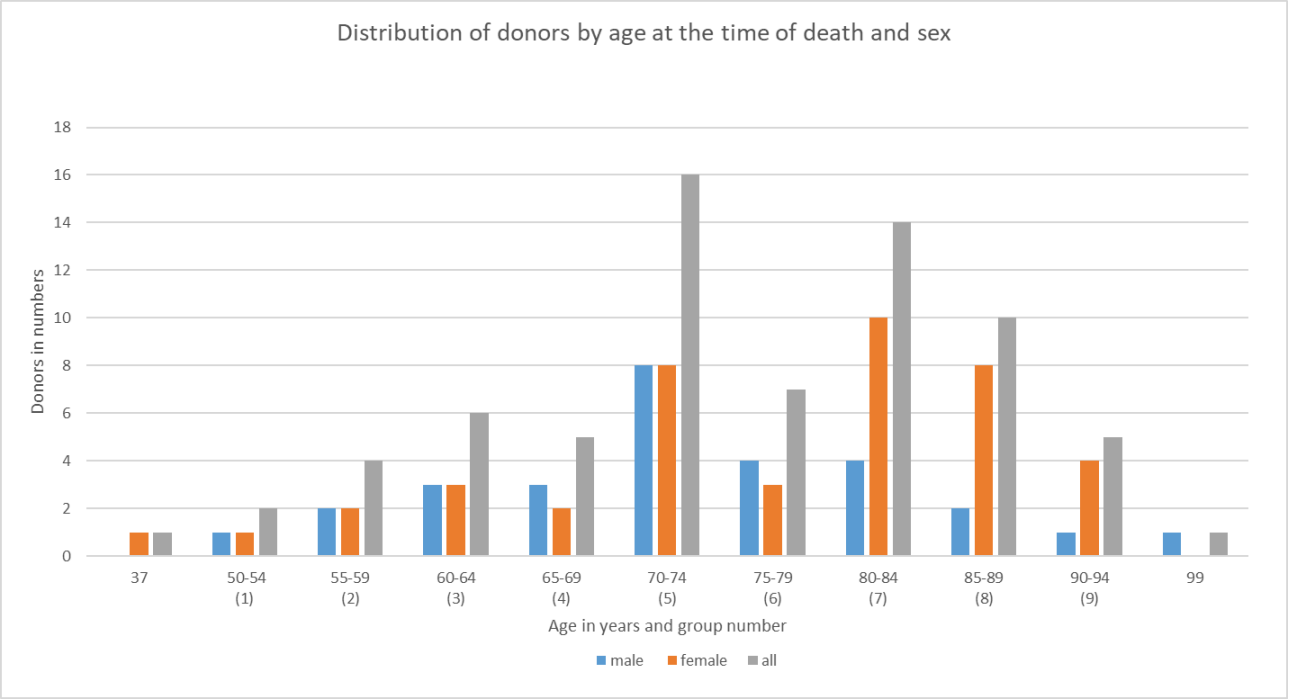
The first dataset examend shows the age of the donors at the time of their death. To get a better overview, the deceased donors were divided in groups according to their age at the time of their death. Each group contains the donors from a five-year time period. For example, the first group contains all donors who were between the age of 50 and 54 years at the time of their death.
Two people were not assigned to any group, as their ages fell out the assigned statistical range and were therefore listed separately. The first of these donors died at the age of 37, making him the youngest among the deceased. The second person who was not assigned to a group died at the age of 99 and is therefore the oldest person of the group of already deceased donors.

As seen in Figure 5.,the first group, which contains the donors who died between the age of 50 and 54, is, with one male and one female, the smallest group. The second group, from 55 to 59 years old, contains two males and two females. This linear increase continues and can also be seen in the next group, which contains three male and three female donors, who died between the age of 60 and 64. After that a small decrease in donors can be observed, with one less female in the group of the 65 to 69-year-olds in comparison to the previous group. The male donors stay the same, which makes a total of 5 donors in that group.

Following that small decrease, a peak occurs. The group 5 contains all donors who died between the ages of 70 and 74, with 8 males and 8 females, which makes this group the biggest group. This peak is followed by a significant decrease, with only 7 donors in total in Group 6. As seen in Figure 5., this group contains less than half of the donors compared to the large group before. The group with all donors between the age of 80 and 84 years at their time of death shows the second peak of donors, as can be seen in Figure 5. This group, with 10 females and 4 males, is the second biggest group of deceased donors.

The group of the 85 to 89 year olds is, with 2 male and 8 female donors, smaller than Group 7 before them. This decrease can also be seen in the oldest group, which contains all donors who died between the ages of 90 and 94; only one male and four female donors are in this group.
Taking a closer look at Figure 5, it can be seen that in the groups ranging from 50 to 75 years, the male-to-female ratio was more or less equally distributed.However, the groups from 80 to 94 years contain many more women than men. The male peak with 8 men is seen in the group of the 70 to74-year-olds, while the female peak is seen with 10 female donors in the group of the 80 to 84-year-olds.

A more detailed analysis of the distribution using the Shapiro-Wilk test (10) showed that the male distribution, with a p-value of 0,99521, follows a normal distribution. The females however, with a p-value of 0,0039, do not follow a normal distribution. This makes a further comparison of the genders regarding their age at the time of death difficult.



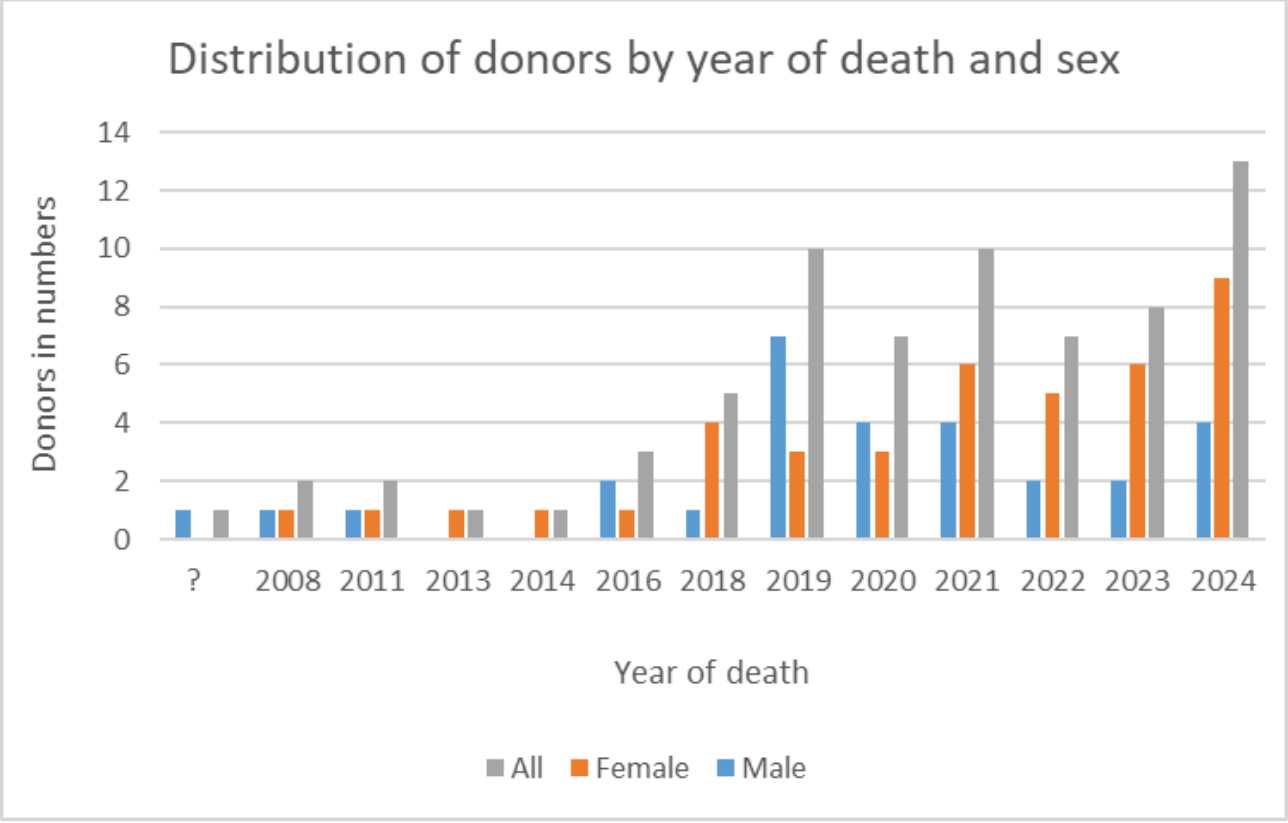
(Figure 5.”Distribution of donors by age at the time of death and sex”)

In total,70 out of the 457 donors have already died. A 77-year-old male and a 84-year-old female were excluded from the analysis because they withdrew their decision to donate their bodies to Vilnius University. In total 41 females and 29 males have already passed away.

The 70 donors were then divided according to their year of death. For one male, there was no information regarding his death date; therefore, he was listed separately with a question mark. As

seen in Figure 6., in the years 2008, 2011, 2013, 2014 and 2016 only one woman died in each year. The only years from this list where male donors died are 2011, where one male donor died, and 2016, when two male donors died. In the other years spanning from 2008 to 2016, no male donors passed away.

In 2018, a total of five donors passed away: four female donors and one male donor. In Figure 6., it can be seen that the year 2019, in which 7 male donors passed away, was the year with the most dead male donors. In total, ten donors died that year.
In 2020, four male donors and three female donors died; making a total of seven deaths. One year later, in 2021, ten donors died in total,which, together with 2019, is the year with the second-highest number of donors dying. In 2022, two male and four female donors died. In the following year the number of dead male donors stayed the same with four donors. The number of deceased female donors increased that year, with a total of six deceased female donors. The year with the highest occurrence of deceased female donors, nine in total, is also the year with the highest number of total deceased donors. As seen in Figure 6., that year is 2024, with a total of 13 deceased donors. This means that 18,6% of all deceased donors died last year, in 2024.



(Figure 6.”Distribution of donors by year of death and sex”)

Another dataset, which can be derived from the group of deceased donors is the number of bodies currently in use for research at Vilnius University. To extract these numbers, the filter settings were adjusted so it would be visible how many people are deceased in total. From that number, donors who are already cremated were subtracted. This makes a total of 30 bodies who should be in use right now. But when taking a closer look at the database and adjusting the filter settings further, it becomes evident that bodies who were not received for any reason cannot be calculated into the analysis of how many bodies are currently in use at the University.

Reasons why bodies can not be used by the University include delayed preservation of the body and rapid decay, massive destruction of the body, or death in a foreign country.(6)These bodies which were never received, pose the problem that there is no information available in the database regarding whether they were cremated or not. Because of this, they do not appear in the statistics of donors who are already buried.

These bodies that have never been received by the University also need to be taken into account. Taking all these parameters into consideration, the following formula can be derived to calculate how many bodies are in use at Vilnius University at the moment: “All dead donors” minus (“All cremated donors” plus “All bodies who have not been received").This equals “All bodies currently in use at the Vilnius University”.
To put this formula into numbers: 70 - (40 + 9) = 21. We conclude that, at the moment there are 21 bodies in use for research at Vilnius University.

4.1.7 Period of Body usage

Another set of data which can be extracted from the Vilnius university body donor database is the period of body usage. This is the duration of time in which the Vilnius University is allowed to use the body before they have to return the remains to the family or bury them.

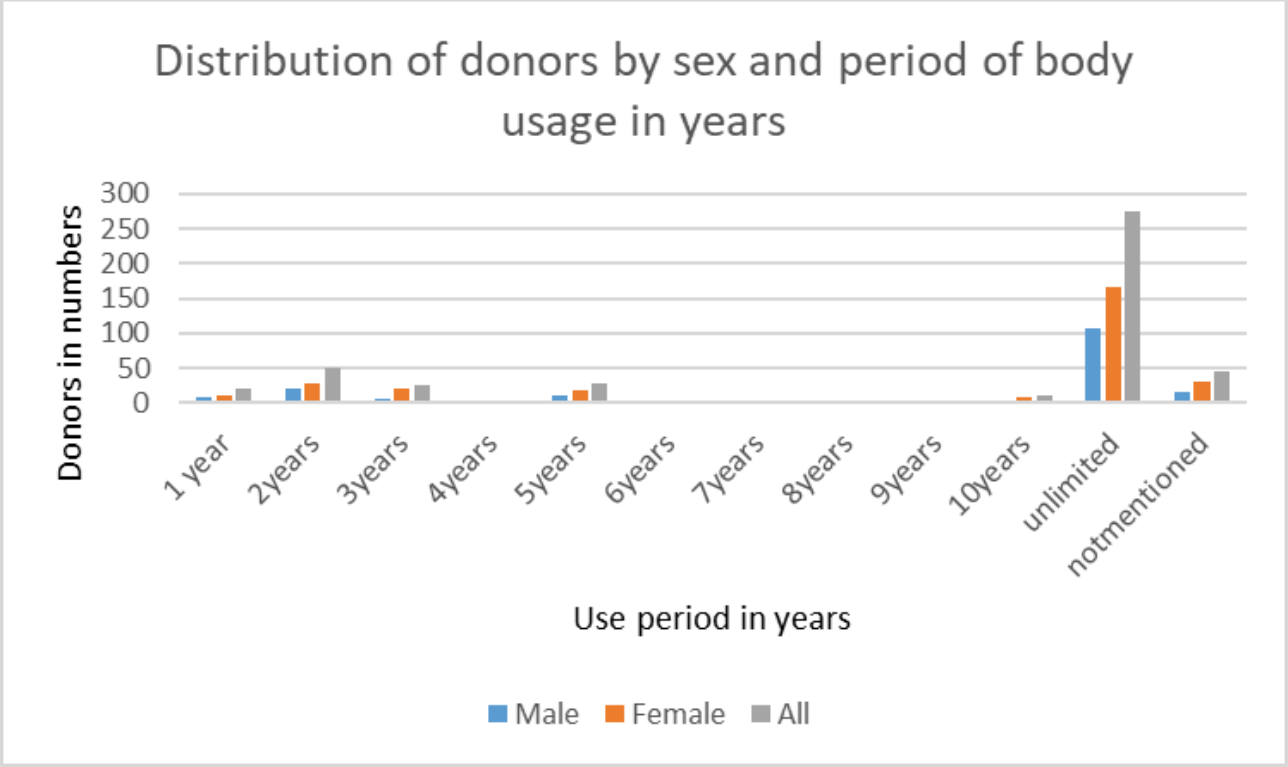
To determine the period of body usage, the donors were categorized into different groups based on the duration of time for which the University is allowed to use their bodies. A total of twenty body donors opted for the shortest possible period, which is one year. This group contained 9 male and 11 female donors, resulting in a nearly equal gender distribution.

Forty-nine donors decided to donate their bodies for a time period of two years. Five males and twenty females chose to provide their body for a duration of three years. A four-year period was

only selected by one male and one female donor. In comparison to the four year period, there is a significant increase to the five year time period, with a total of 25 donors opting for this duration.

The options to provide the body as study material for the Vilnius University for six, eight, or nine years were not chosen at all. As seen in Figure 7., only the seven-year duration was selected, but it contains only one male and two females,forming just a small group of donors. The option to donate their body for a time period of ten years was chosen by ten people in total.

As shown in Figure 7., the most frequently selected option was, by far, the donation of one's body for an unlimited time period. This means the University is permitted to use the body for scientific purposes as long as necessary.A total of 275 donors chose this option, representing 60,2% of all registered donors. For 9,8% of donors, there is no available information regarding the desired duration of use of their remains for the University's medical training purposes(6).



(Figure 7.”Distribution of donors by sex and period of body usage in years”)

At the moment there are 21 bodies in use at Vilnius University, these can be further categorized according to the time period for which the University is allowed to use these bodies. With 52,4%, the majority of the donors agreed to the usage of their corpses for an unlimited time period. Two of the donors provided their body for a time period of one year: one male whose remains should be returned to his family at the end of June 2025 and one female whose remains should be buried at the

university cemetery at the beginning of March 2025. As seen in Table 1., three females agreed to a two-year-period for their bodies to be used for scientific purposes after death. The first body is in use until the 16th of January 2026, the remains of the second female should be returned to the family at the end of March 2026, and the last of these bodies is in use until the 9th of August 2026. One male and two females agreed to a 3-year-time period in which the University can use their bodies. The male donor's body is in use until the 6th of November 2025, one of the females until the 1st of August 2026, and the other female until the 5th of October 2027. Two donors, both female, decided on a 5-year-period for their corpses to be used by the University. The body of the first female will be at the University until the 26th of April 2026, the second female's body until the 27th of August 2027.

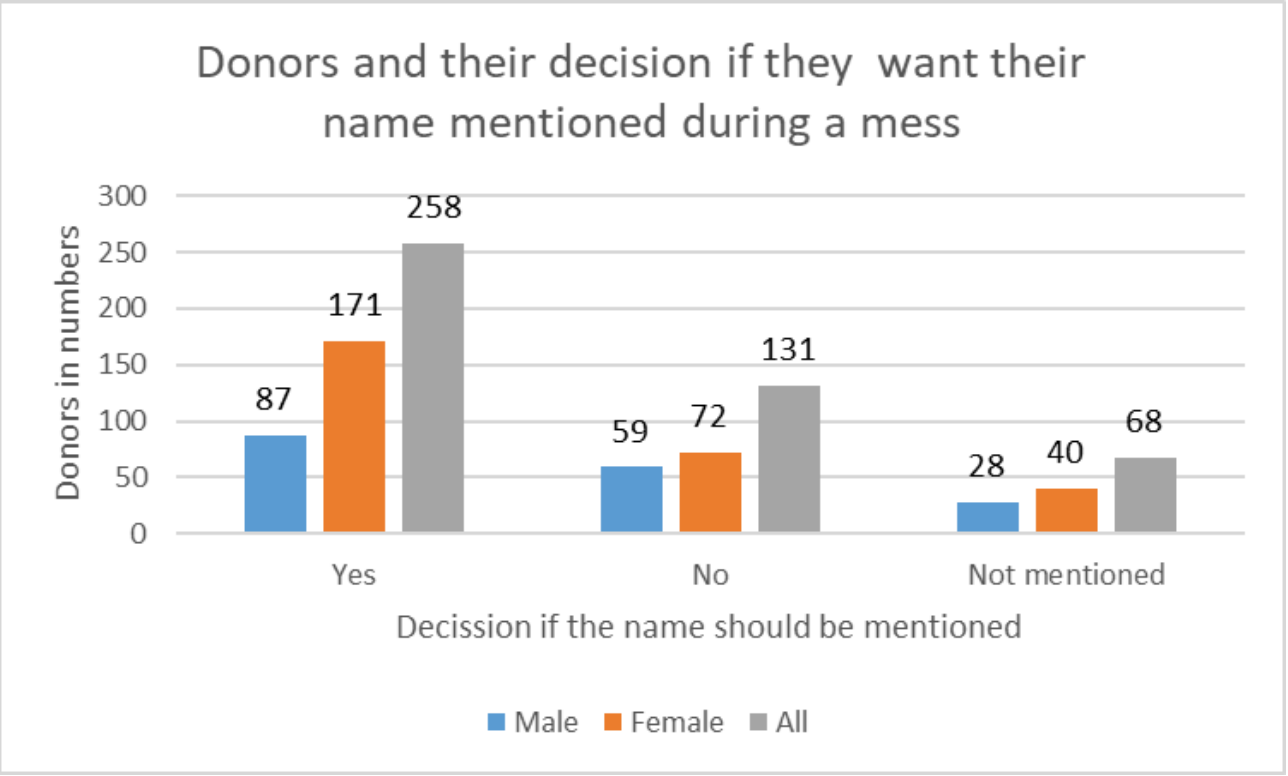
Table 1."Permitted utilization period for bodies in use at Vilnius University (31.12.2024)"

Sex	1 Year	2 Years	3 Years	5 Years	Unlimited
Male	1	0	1	0	3
Female	1	3	2	2	8
All	2	3	3	2	11

4.1.8 Mentioning Name during Mess

A decision that should be made by all the donors who are registering at the Vilnius University body donor register is whether they want their name to be mentioned during the annual ceremony held in honor for deceased body donors in Vilnius. This ceremony is an established tradition at Vilnius University to show respect for the decision to donate their bodies to medical training and science. It is also respected if a person does not wish to be part of this tradition and does not want to be mentioned during the ceremony. (6)

As seen in Figure 8., 258 people, 87 males and 171 females, decided that they want their names mentioned during the annual ceremony. This accounts for 56,5% of all donors. On the other hand, 59 males and 72 females decided that they do not want their names mentioned during any of the ceremonies, making up 28,7% of all donors. For 14,9% of all donors there is no information regarding their wish to be mentioned during the annual ceremony, this is why they are shown separately in Figure 8.

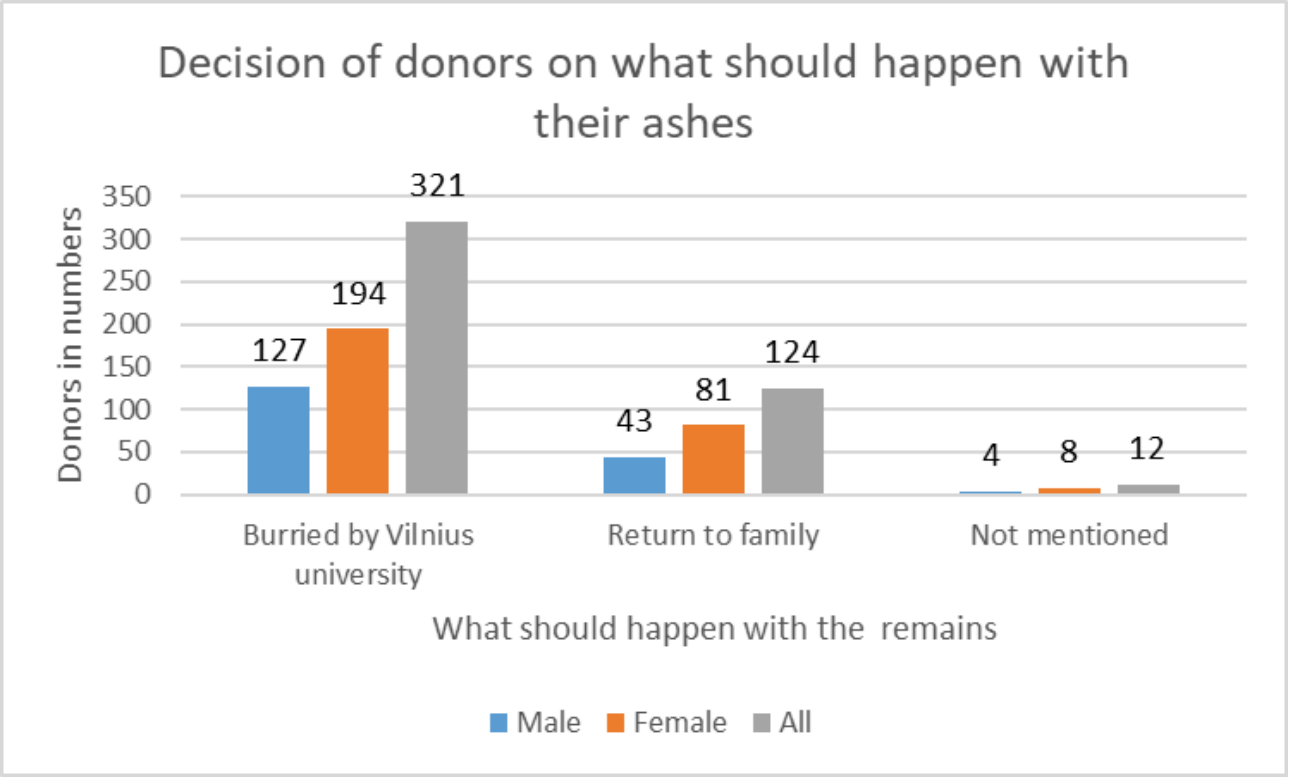


(Figure 8.”Donors and their decision if they want their name mentioned during a mess”)

4.1.9 Urn with ashes

Another decision that has to be made by a donor, which can be obtained as well from the Vilnius University body donors database, is the decision of what happens to their remains after the university is finished with their studies and usage of the bodies. Since 2010, all bodies that were donated to Vilnius university have been cremated. The donors are informed about this in advance (6). This means that they should decide in advance what they want to happen with the urn and their ashes.

In Figure 9., it can be seen that 127 males and 194 females decided, which is 70,2% of all donors, that they want their ashes to remain with Vilnius University and get buried by them. 27,1% of all donors want their urn with their ashes returned to their family so they can bury them at the place of their choice. For 4 males and 8 females, there is no mention of where the remains should be taken, after cremation. This group is, with 2,6%, the smallest group by far.



(Figure 9."Decision of donors on what should happen with their ashes")

4.2 Geographical distribution of body donors from Vilnius University in Lithuania

Utilizing additional data provided by the Lithuanian government (11), it is possible to compare the donors according to their place of residency in Lithuania. To analyse this data, it is essential to recognize the administrative structure of the country. Lithuania is divided into 60 administrative regions known as municipalities. By combining data from the "Vilnius University Body Donors Database"(the municipality of residence of each donor), along with the additional data from the Lithuanian government, a dataset was developed. The newly created dataset includes information about the age distribution of the inhabitants of the region, as well as the number of male and female inhabitants in said region.

The most interesting statistic derived from this dataset is the distribution of donors across the various regions, expressed in both absolute numbers and as an average number of donors. For a better overview and better comparison, the 60 municipalities were divided into the 10 counties of Lithuania.(11)To compare these 10 counties, the first step is to look at each of them in detail at first and later compare them to each other to find parallels, similarities, and also differences.

4.2.1 Alytus County

The first region to be analysed is the county of Alytus, which is named like all counties in Lithuania after the capital of the county, in this case Alytus city. The county has a population of 139.946 inhabitants, of which 47,6% are male and 52,4% are female. The largest age group, with 15,9%, consists of individuals between 50 and 59 years of age. The municipality of Lazdijai is with 18.120 people the smallest region, while Alytus city, with 52.034 people, is the biggest municipality. Alytus city is with a total of 8 donors the region with the most donors. Lazdijai with no donors at all, is the region with the fewest donors. In total the county of Alytus has 19 donors, corresponding to a rate of 13,6 donors per 100.000 inhabitants.

4.2.2 Kaunas County

The second region to take a closer look at is the county of Kaunas, with its capital, Kaunas city. The county has a total of 612.832 inhabitants. Of these, 117.649 live in the largest municipality, which is at the same time the capital of the county. The smallest region in the county of Kaunas is the municipality of Birštonas, with only 4.339 inhabitants, making it the smallest in all of Lithuania. Kaunas county consists of eight municipalities, which are home to 21 donors in total. The most donors come from the capital, Kaunas city, with a total of 6. The lowest number of donors, with 0, comes from Birštonas. However, when taking a closer look at the donor numbers in the county, especially considering the number of donors per 100.000 inhabitants, the municipality with the highest numbers is Kaišiadorys. Here, there are as many as 17,4 donors per 100.000 inhabitants. Kaišiadorys has 5 donors but only 28.681inhabitants. Compared to the capital, Kaunas city, which has the highest absolute number of donors but only 1,9 donors per 100.000 inhabitants, Kaišiadorys has more than 9 times the amount of donors per 100.000 people. The average number of donors per 100,000 people in thes county of Kaunas is 3,4. This is the lowest average of donors in Lithuania.

4.2.3 Klaipėda County

The county of Klaipėda consists of seven municipalities, with a total population of 368.435 inhabitants. The gender distribution within the county is nearly balanced, with a male to female ratio close to fifty-fifty. The largest municipality is Klaipėda city, home to 170.519 people. 46,3% of all inhabitants live in the main city of the county. In contrast, the smallest municipality is Neringa, with a population of only 5.404 inhabitants, representing just 1,5% of all residents in this

county. In terms of body donation, the county of Klaipėda has a total of 22 registered donors. The majority of them live in the capital city with a total of 9. The lowest number of donors come from the municipalities of Neringa and Skuodas, each with only one registered donor. On average the county of Klaipėda has 6 donors per 100.000 inhabitants.

4.2.4 Marijampolė County

The region of Marijampolė has 68.563 males and 72.159 females, resulting in a total population of 140.722 inhabitants. Most people(56.875) live in the capital, Marijampolė city. The smallest region is Kalvarija, with 10.146 inhabitants. When taking a closer look at the number of donors, a few observations that stand out. With a total of three donors, which is half of all donors of Marijampolė county, the highest number of donors do not come from the capital of the county they come from Vilkaviškis, the second largest municipality in the county. In contrast, the capital of the county has only one registered donor, placing it second to last among the municipalities of this county. Two regions have no donors at all. Due to these low numbers, the county of Marijampolė has only a total of 6 donors, which is only 4,3 donors per 100.000 inhabitants. This makes it the county with the lowest number of donors in Lithuania.

4.2.5 Panevėžys County

With 88.363 inhabitants, Panevėžys city is the largest municipality in the county of Panevėžys. The county is divided into six regions, with a total of 217.127 inhabitants, of which 53% are women and 47% are men. 24 out of the 50 donors in this county come from the capital Panevėžys city. This makes 27,2 donors per 100.000 people in this municipality. However, this figure is only the third-highest number of donors per 100.000 people among the regions of the county. The second-highest rate is observed in the smallest region of the county, Kupiškis, which has 16.278 inhabitants. Here, five donors are registered in the database, corresponding to 30,7 donors per 100.000 inhabitants. The highest number of donors per 100.000 inhabitants in this county is found in the region of Biržai. In this municipality, 10 out of 23.540 inhabitants have chosen to donate their bodies, resulting in the second highest average of donors, with 42,5 donors per 100.000 inhabitants, in all of the 60 municipalities.

4.2.6 Šiauliai County

With 284.922 inhabitants, Šiauliai is the fourth largest county in Lithuania. It is the only county in Lithuania with more male than female inhabitants, but this difference in the male to female ratio is very small, with 50,6% males and 49,4% females. The biggest difference in this ratio can be seen in the capital, Šiauliai city, which has a total population of 121.288, with 53% are males and 47% females. The smallest of the seven municipalities, with 18.485 inhabitants, is the region of Pakruojis. It is also one of the two regions in the county, along with the rural area of Šiauliai, that have no donors at all. The region with the highest absolute number of donors is the capital, Šiauliai city, where a total of 12 donors are registered. However, the highest number of donors per 100.000 inhabitants is found in the region of Akmenė, with four donors among 19.845 residents, corresponding to 20,2 donors per 100.000 inhabitants. On average, the entire county of Šiauliai has nine donors per 100.000 inhabitants.

4.2.7 Tauragė County

Tauragė County, with a population of 97.654, is the smallest of the ten counties in Lithuania. It is divided in four municipalities, with Pagėgiai being the smallest, having 7.836 residents, and Tauragė City being the largest, with 40.626 inhabitants. Most of the 12 donors from Tauragė County come from the capital of the county. The remaining four donors are equally distributed between the municipalities of Šilalė and Jurbarkas. On average, the county has nine donors per 100.000 inhabitants, with the highest average observed in Tauragė City, with 19,7 donors per 100.000 inhabitants.

4.2.8 Telšiai County

Telšiai County is divided into four municipalities, of which Mažeikiai, with 54.753 inhabitants, is the largest. The capital of the county, Telšiai City, with 41.016 inhabitants, is only the second largest region. The county has a total of 137.931 inhabitants and nine donors, which corresponds to 6,5 donors per 100.000 people. Five of the nine donors come from Mažeikiai, while the remaining four are evenly divided between the capital of the county and the region of Plungė.

4.2.9 Utena County

The county of Utena has 131.416 inhabitants, of which 40.128 live in the largest municipality, which is also the capital of the county, Utena city. The county is divided into six regions, with the smallest municipality being Ignalina, which has only 14.357 inhabitants. More than half of the donors come from the region of Anykščiai; this municipality is home to 12 of the 23 donors in this county. This corresponds to 51,3 donors per 100.000 people, making the municipality of Anykščiai the region with the highest average of donors in all of Lithuania. The lowest number of donors in Utena County, with only one donor, comes from the region of Zarasai, which is the second smallest region in the county. The remaining ten donors are distributed among the four other municipalities. Molėtai and Visaginas each have two donors, while Utena City and Ignalina each have three registered donors. The county has on average 17,5 donors per 100.000 inhabitants.

4.2.10 Vilnius County

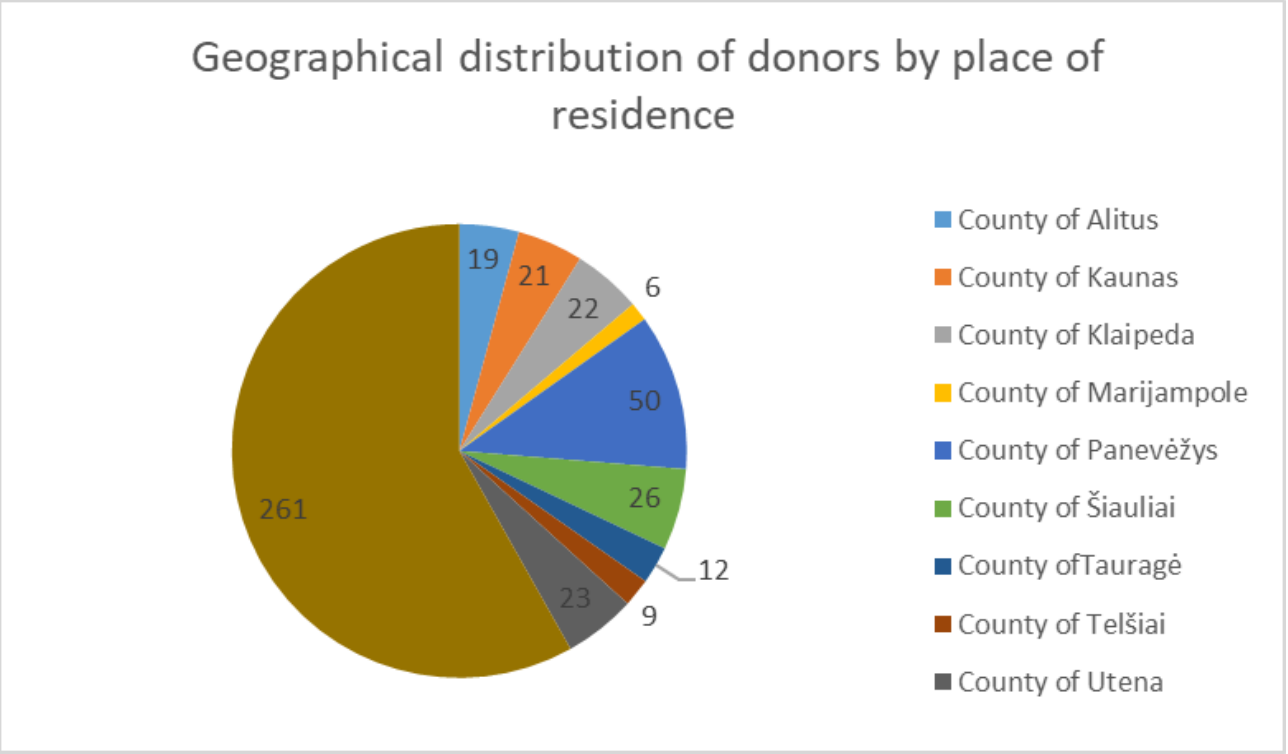
The county of Vilnius, with its capital Vilnius City, which is also the capital of the entire country of Lithuania, is home to 923.573 people. This makes it the largest county in Lithuania, with the largest municipality, Vilnius City, having 632.476 inhabitants. The smallest region in the county is Širvintos, with only 15.468 inhabitants. Of the 261 donors in the county, 214(82%) are from the capital, resulting in an average of 33,8 donors per 100.000 inhabitants. However, this is only the second highest number of donors per 100.000 inhabitants in the county. The highest average is observed in the municipality Švenčionys, with nine donors among 22.780 inhabitants, which equates to 39,5 donors per 100.000 people. Overall, the whole county has on average 28,3 donors per 100.000 inhabitants. The lowest number of donors is recorded in Šalčininkai, it is the only municipality in the county with no donors at all. The distribution of the remaining donors is as follows: 15 donors come from the rural area of Vilnius, 9 donors are from Ukmergė, 5 each from Elektrėnai and Trakai, and 4 donors are from Širvintos.

4.2.11 Comparison of the Counties

After taking a closer look at each of the ten counties, the next step is to compare them with each other and outline the parallels, differences, and similarities. For a better understanding of the number of donors, they were compared and illustrated in a pie chart, which can be seen in Figure

10. Due to the lack of data on the place of residence for some donors and the consent withdrawal of two donors, the dataset includes only 449 donors.

The first noticeable aspect is the distribution of the donors. As shown in Figure 10., 261 out of the 449 (58,1%) in the dataset come from Vilnius County. This figure is more than five times higher than that of Panevėžys County, which ranks second with a total of 50 donors. Šiauliai County follows in third place, with a total of 26 donors. The counties of Utena(23 donors), Klaipeda (22 donors), Kaunas (21 donors), and Alitus (19 donors) are pretty similar in terms of donor numbers. The county of Tauragė, with only 12 donors, is the region with the third lowest number of donors. Telšiai follows with just 9 donors in total. The county with the fewest registered donors is Marijampolė, with only 6 donors in the whole county.

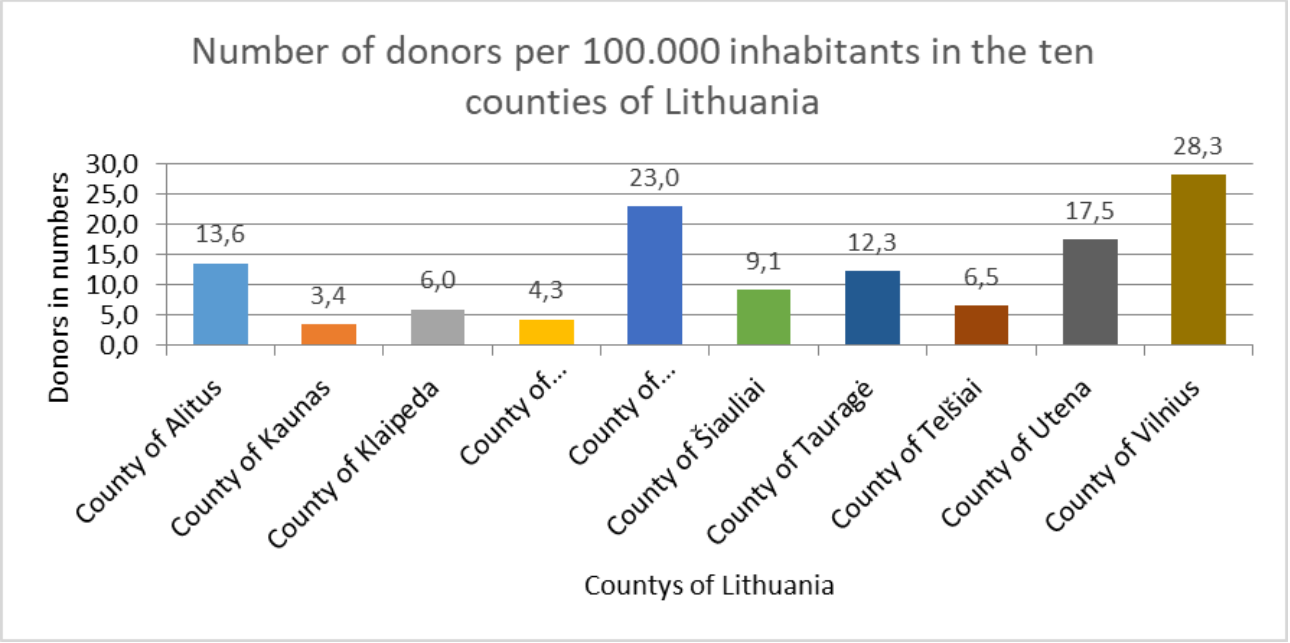


(Figure 10.”Geographical distribution of donors by place of residence")

These numbers clearly show which regions have the most donors. However, what these numbers do not show is how many people live in the region. Naturally, Vilnius County has the most donors because it also has by far the largest number of inhabitants. To accurately compare the counties in terms of how many people are willing to donate their bodies, it is necessary to take a closer look at the average number of donors. This can be achieved by examining the number of donors per 100.000 inhabitants in each region and comparing these numbers with the national average of donors per 100.000 inhabitants in all of Lithuania. These numbers can be seen in Figure 11.

The countries of Vilnius and Panevėžys remain at the top, with Vilnius having 28,3 donors per 100.000 people and Panevėžys 23. Although there is still a noticeable difference compared to the total numbers shown in Figure 10., the two counties are now much closer and more similar in terms of numbers. Said two counties are followed by the region of Utena with 17,5 donors per 100.000 inhabitants. The region of Alitus, with an average of 13,6 donors, has also achieved a higher ranking. The county of Tauragė, which was in the lower third in terms of the total donor numbers (Figure 10.), now ranks in the middle range with 12,3 donors per 100.000 inhabitants. The biggest difference in numbers can be observed in the counties of Klaipeda and Kaunas. Although they were similar to Utena or Alytus in terms of the total number of donors, Klaipėda now has only six donors per 100,000 inhabitants, and Kaunas, as shown in Figure 11, is the county with the lowest number of donors per 100,000 inhabitants, with just 3.4 donors.

To put these numbers into context and get a more detailed overview of the geographical distribution of the donors, a Chi-square test (10)was performed. The test showed a Chi-square value of 237,6 this and a p value < 0,0001 showed statistically significant difference between the expected and observed distribution of body donors across the ten Lithuanian counties.
The result of the Chi-square test indicates that the geographical distribution is not equally proportional to population size. This can be seen in counties like Vilnius and Šiauliai, which have significantly more donors than would be expected, whereas counties like Kaunas and Klaipėda show disproportionately low donor numbers.



(Figure 11.”Number of donors per 100.000 inhabitants in the ten counties of Lithuania”)

4.2.12 A closer look at the municipalities with the highest donor average

After taking a closer look at the different municipalities and counties and comparing them to each other, a few regions, particularly some municipalities, stand out in terms of number of donors per 100.000 inhabitants. Taking this into account, the next step would be to compare these regions to each other, but also to the regions which are similar to them in terms of population size.

The regions with the highest numbers of donors per 100.000 inhabitants are Anykščiai with 51,3 donors, followed by Biržai with 42,5 donors and Švenčionys with 39,5 donors. These three municipalities are very similar to each other in terms of population. Anykščiai has a total of 23.400 inhabitants, Biržai 23.540 inhabitants, and Švenčionys 22.780 inhabitants. In terms of male to female ratio, they are also similar, with slightly more female than male inhabitants. This gender distribution is typical for most of the 60 municipalities. For a better comparison and to provide context, these numbers can be compared to the municipalities of Pasvalys, Šilalė, Visaginas and Kelmė, which are the most similar in terms of population. Pasvalys has 23.031 inhabitants, Šilalė 21.924 inhabitants, Visaginas 21.116 inhabitants and Kelmė 25.607 inhabitants. Overall, there is no significant difference in age distribution among these municipalities.

The only numbers that differ are the number of donors, while all other variables are similar.
The municipality of Anykščiai has 12 donors, Biržai has 10 donors, and Švenčionys has 9 donors. In contrast, the municipalities used for comparison, due to their similarity in population size, male to female ratio and age distribution, each only have two registered donors. This means the three municipalities with the highest number of donors per 100.000 inhabitants have four to six times more donors than municipalities used for comparison.

To further analyse these numbers, compare them, and identify other municipalities with a higher than expected number of donors, a chi-square test (10)was conducted. Therefore, the expected number of donors in each of the 60 municipalities was calculated. After that the Chi-square contribution for every region was determined and then summed.

The result was a Chi-square (10)value of 347,1. The critical value ($\alpha = 0,05$ and degree of freedom = 59) is 77,93. This result, along with a p value<0,0001, indicates that the distribution of body donors in Lithuania is not evenly distributed and is influenced by regional factors.

The ten regions with the largest deviation between the expected and actual number of donors are shown in Table 2. The region with the highest deviation was Vilnius city, with 120 more donors than expected. The regions of Panevėžys city, Anykščiai and Biržai, which were the municipalities with the highest donor average, also showed a statistically significant deviation($\alpha = 0,05$ and degree of freedom = 1 results in a critical value of 3,84).
Contrasting this, regions like Kaunas city, Klaipėda city, and Šiauliai had significantly lower numbers of donors than expected.

Table 2. "Top 10 municipalities with the highest deviation of donors"

Municipality	Total number of donors	Expected number of donors	Deviation
Vilnius city	214	92,97	**121,03**
Kaunas city	6	46,19	**−40,19**
Klaipėda city	9	25,07	**−16,07**
Kaunas	3	17,29	**−14,29**
Panevėžys city	24	12,99	**11,01**
Klaipėda	2	11,14	**−9,14**
Anykščiai	12	3,44	**8,56**
Marijampolė	1	8,36	**−7,36**
Biržai	10	3,46	**6,54**
Šiauliai	0	6,3	**−6,30**

5. Discussion

After a detailed analysis of the database and extracting multiple datasets and various information about the donors, several interesting findings were identified, which could be used by Vilnius University in the future.
Firstly, looking at the literature, we can see that Vilnius University is not the only one that holds ceremonies in honor of body donors.(6) According to Riederer et al. 95.5% of human anatomy programs based in the United States of America hold such ceremonies as well. An example is an

annual ceremony held by the Mayo Clinic Bequest program, and, like it is done at the University of Vilnius, the ceremony is attended by students, professors, and family members of the donors. (2,6) Having a designated place to bury the remains of donors and holding ceremonies seems to be of importance as well. In Seoul, Korea, a charnel house was built at the Chung-ah Park in order to honor and thank the dead that contributed with their bodies to medical research and studies. The University of the Basque Country has established the “Forest of Life” at their Campus near Bilbao. Here the urns and ashes are kept beneath the huge wooden pillars that form the “Forest of Life”, and the place can be used for ceremonies as well. (2)

At Vilnius University, 70,2% of the donors decided that they wanted their ashes to remain with the Vilnius University and be buried by them. Vilnius University will soon have such a special place for burials and ceremonies as well, as Vilnius municipality has agreed to devote a part of the historic cemetery in the center of Vilnius to the body donors who gave their bodies for anatomy studies and research. So, in the future, it will be possible to bury the remains and ashes of the donors there. (6)

Testimonies of respect, such as the participating in commemoration ceremonies by students and the erecting of monuments in honor of donors, could even have a positive impact on donation numbers. Monuments seem to be especially important to family members in order to have a popper place for mourning. (2) The Faculty of medicine of Vilnius University plans to build a monument for the donors at the historical cemetery in Vilnius. (6)

Another interesting thing that can be observed in the database is the dip of donor numbers in 2020 and 2021. The registration for body donations at the Vilnius University had steadily increased and had a peak of 69 donors registering in 2019. Then, in 2020, the numbers dropped to 39, and in 2021, to only 21 donor registrations in the whole year. The number just recovered with 71 donor registrations in 2024.

During the same time, the “COVID-19” Pandemic hit Lithuania. The infection, caused by a virus, was first seen in December 2019 in Wuhan, China, after being the reason for several pneumonia cases. In January 2020, the World Health Organisation declared an international health emergency, and in March 2020 a Pandemic was declared, and health contingency plans were put in place. (12)

The example of Spain might give insight into one reason why there have been less body donations, or in some countries even no donations at all, during the years of the COVID-19 pandemic.

In Spain, all educational and university research activities were stopped in March of 2020. There were restrictions put in place for burial and cremation, which made the management of body donations complicated, and the nationwide lockdown plus the elevated mortality caused by COVID-19 did not make things easier. Moreover, due to the fact that all 76 Spanish universities agreed to a complete closure of service and their facilities the administrative work that included the management of the body donation programs was suspended.(13) And Spain was not the only country, the UK and Ireland (14), Australia and New Zealand, (15) and India (16) all seem to have faced similar situations.(13)

Another reason for the decrease in donors during the time of the COVID-19 Pandemic could be one that is caused by the circumstances that came with it. Similar to the decrease in body donors, Lithuania saw a decrease in blood donations as well. Here, a cause can be attributed to the decreased availability of civil and healthcare infrastructure, the lack of transportation and therefore mobility as well as the decrease in service provision in general. Also, fear and illness could have played into it as well. (17) Some of these factors might have played into the drop in body donors as well.

When taking a look at the gender distribution in the database, two things are noticeable. First, it can be seen that more women are registered in the database than men. There are currently 175 men and 284 women registered. The Lithuanian society consists of 48,8% men and 51,2% women at the moment. This shows that in the database, contrary to the real society, the genders are not distributed equally, and women are generally over represented. The second thing that can be seen is that women seem to be older on average than men. They are older on average at the age of informed consent. Here, men give their consent for donating their body at 63 and women on average at 66 years old. Also, the average age of women right now is 70 years, and the average man is currently 67. On average, the men in the “Vilnius University Donor Database” seem to die younger as well. They die at an average age of 73 years, whereas the women die at an average age of 77 years. This can be also seen in Figure 5. where the ages ranging from 50 to 75 years have a nearly equally distributed gender ratio, but the groups from 80 to 94 seem to have a gender gap favoring women. These findings can lead to two questions: What drives people to donate their body to science ? and Are women more altruistic?

Literature findings on the topic of altruism suggest that women are indeed more altruistic than men. Many studies have been conducted on this topic, with a lot of them using dictator game experiments. (18) Altruism seems to be connected with a strong meaning of purpose in life, of

which women enjoyed higher levels. Strong purpose in life is also connected to psychological and physical health. (19) Because women were more likely to behave altruistically, their life purpose was stronger. (19) Other research, like Rand et. al., suggest that women are not only more altruistic, they are expected to be more altruistic than men by society and even are punished if they are not. Therefore, women, but not necessarily men, can internalize altruism as an intuitive response. (20) This was also suggested by Brañas-Garza et. al., who did an analysis on this topic. (18) In addition to this, research suggests that both men and women overestimate the level of altruism among women.(21)

For both genders, the desire to help and be useful seems to be the driving force in the decision process of becoming a body donor. Cornwall et al. did an interesting study on the different reasons for body donations. Here they found that 86.4% of participants named helping medical science and teaching as their primary reason for body donation. Other reasons for body donation included: gratitude to medicine, loneliness and absence of relatives, prices of the funeral, or general dislike of funeral practices.(22)

In this study, they identified 5 main categories of reasons for body donation: Usefulness, Uniqueness, Kinship, Gift giving, and Impermanence.(22)

Altruism can be possibly attributed to the finding of Usefulness as the most named reason for body donation. This includes being useful to medical students, to scientific research, or to the general public. What is important to consider here is something that Cornwall et al. came across during their research. Sometimes the desire to be useful stems from a deeply rooted feeling to be useless at the moment or to have lived a useless life so far.

It is well documented among the elderly that the feeling of being useless is increasing with age. So sometimes the motivation to donate one's body might be connected with the feeling of being a burden to society and “at least” giving something back by donating the body that “is not needed anymore” to medical studies. Therefore, institutions offering body donation programs should keep in mind that they might be dealing with vulnerable population groups like these. and support should be available. (22)

Another reason for body donation that Cornwall et al. could identify was Uniqueness. Here, the participants had one or more factors that made their specific body unique in their eyes. They mostly included physiological or pathological differences. The donors often seem to think that the specific

condition they have might be interesting to medical students or could help in the improvement of the treatment of future patients with the disease they had. (22)

Here it is important that the potential donors are informed appropriately about what a body donation really is. It is generally unlikely that their individual body will make a contribution to medical advancement. Furthermore, since body donations are generally used for the education of medical students the standard anatomy is the main focus during the teaching and not pathogenesis. So it is important for institutions to clearly communicate this to potential donors in order to guarantee informed consent.(22)

The third reason to donate one's body, Cornwall et al. called “Kinship”. This includes all kinds of familial concerns, but is not limited to blood relation. It also includes the cost of funerals and loneliness experienced among donors, or previous donations of a loved one that inspired the current donor. Sometimes the driving factor for donation can be the cost of funerals, as the donor does not want to inflict an economic or emotional burden on their family member. If the reason for the donation is financial, it can lead to conflicts within the family because of the guilt connected to it. Another reason could be no family members altogether, but they still want to be remembered and can feel remembered in this way. (22)

In this reason of Kinship or family, there are two possible explanations as to why there are generally more women registered in the “Vilnius University Body Donor Database”. The first being loneliness. It is generally known that women are expected to outlive their male counterparts by 4 to 5 years. (23,24) In Lithuania, the Gender Gap in Life Expectancy is even bigger, with 10,5 years, making it the biggest Gap in all of the EU, followed by Latvia and Estonia.(25) So, if these women do not have any children or other living relatives, they might turn to body donation.

Another reason why we see more female donor registration might be poverty. The Organisation for Economic Co-operation and Development states on the topic of reducing poverty and social disparities in Lithuania that elderly women are most affected by poverty in Lithuania. This can be seen in other countries as well and can mostly be attributed to the lower pension income received by women. On average, it is around 22% lower than that for men due to lower lifelong earnings and shorter contribution periods, for example, due to earlier retirement and career breaks for example for childcare. In addition to this, elderly women more often live in single households, as their life expectancy is higher. (26,27)

Gift giving can also be a reason for the decision to become a body donor. This depends mainly on specific experiences made by the donor during their life that involved the medical field. So, the donation is done as an act of reciprocity for past medical treatment received by them or family members, or just purely the feeling that they want the University to be able to provide hands-on high quality medical training.(22)

Impermanence was the last reason identified by Cornwall et al.. This can sometimes be linked to faith, including references to the materialistic nature of the human body, and it not being important anymore after death. It is not a common reason but should not be overlooked, as spirituality can play a role in body donation decision making. (22)

Another factor that seems to influence the decision on becoming a body donor or not is education level. The hypothesis here would be that people with a higher education or people who have a biomedical education background choose to donate their body more often than people who are less educated. This was looked at by Vilijoen and Stephens et al., where they found that indeed people with an education in biomedical science have a more positive outlook on body donation, with people who already graduated having a better view on it than undergraduates. Having dissection experience did not seem to have a negative influence on the perception of body donation. (28) So, these results point in the direction that one target group for whole body donation could be people involved in these sciences, like doctors, nurses, and biomedical scientists.

Lastly, looking at the dataset created for the analysis of the geographical distribution, an interesting observation was the large number of donors that live in the municipality of Anykščiai. Here, they have 51,3 donors per 100,000 inhabitants, followed by Biržai with 42,5 donors and Švenčionys with 39,5 donors. These numbers are very high and stand out, but there is no way to explain them or to find answers, as there is just no information available.

On the other hand, the average number of donors per 100,000 people in the county of Kaunas is 3,4. This is the lowest average of donors in Lithuania. But this might not have statistical significance, as the Lithuanian University of Medical Sciences (LSMU) has a similar donorship program as the Vilnius University, and people who live in the county of Kaunas could be registered there.(29)

This also shows us one of the many limitations this paper has. It is really important to protect the privacy of the donors at all times, but at the same time, through this protection of the donors

privacy, information is missing which could help to find more data about body donations and also give an explanation, or at least a clue, to some of the seen statistics.

It would also help to get an insight into the database of the Lithuanian University of Health Sciences (LSMU) in Kaunas, which has a similar donorship program (29) , to get a bigger group of donors, which would help to clarify statistics which may be overseen due to the small number of people. The insight to the databases of other universities would also be useful to get more information about the geographical distribution to show what the real distribution of all donors in Lithuania is. This can especially be interesting to find more data from municipalities which have a small number of donors, or even no donors at all, in the “Vilnius University Body donors Database”.

This also shows another limitation of this study, the amount of people living in some municipalities. The average of regions which only have a really small number of inhabitants can vary a lot. This can be seen in the example of the municipality of Neringa which has one donor and only 5.404 inhabitants, and therefore has an average of 18,5 donors per 100.000 inhabitants, but this number is difficult to interpret in a context. This can be done more easily when the regions were not divided according to their district, rather with a system that every region has the same size.

Another limitation was that some of the data in the body donors register is missing or not mentioned by the donors. Especially the donors who registered in the early years of the database did not answer all necessary questions, for example, what should happen with their remains after death or how long the university is allowed to use their body after death. But since the establishment of the whole body donation register, a lot has changed and the data collection is much better now, so hopefully, this should not be a problem in the future anymore.

6. Conclusion

After the first in depth analysis of the “Vilnius University Body Donor Database”, it can be said that:

1. The average donor in the “Vilnius University Body Donors Database” makes the decision to donate their body at the age of 65 years. Males make this decision earlier than females. On average, this decision is made 10 years before their death. The average age of death for all donors is 75 years. Male donors die on average 4 years earlier than female donors.

2. 62% of all donors are female, and only 38% of the donors are male, which suggests that women are more altruistic than men. This can be seen in many additional studies and papers which were taken a closer look at.

3. Of the 459 registered donors, 71 are already deceased (41 females and 29 males). Most of them have already been cremated, nine bodies in total could not be received by the university because of various reasons, such as too much time passed between death and the notification of the university. 21 bodies are currently in use at the university, and 11 of them can be used as long as the university needs them. This decision for an unlimited period of time for the university to use the body was made by 275 donors, which is 60% of all registered donors.

4. The analysis of the additional dataset, which was used to get a closer look at the geographical distribution of the donors in Lithuania, has led to a few different results. On the one hand, the municipalities of Švenčionys, Biržai, and Anykščiai have the highest body donor average. Among these three Anykščiai, ranks the highest, which means that inhabitants from this region show a four times higher probability of donating their body than the average Lithuanian. On the other hand, the region which has the biggest deviation from its expected number of donors is the municipality of Vilnius city, with a total number of 212 donors. Here, a Chi-square test (10) was performed, showing Vilnius city has 121 more donors than would be expected in this region.

5. Over the course of the last few years, it can be seen that more and more people decided to donate their bodies. Between 2019 and 2021, a rapid decrease in donations was seen. This could be attributed to the worldwide COVID-19 pandemic. However, since 2021, the numbers have been steadily increasing and have reached a record peak of 71 new registrations in the year 2024. This increase gives hope that in the future the numbers will continue to rise, allowing the university to provide every student with the possibility to join a dissection course, which can be integrated in the study programme of every new medicine student at Vilnius University.

7. List of references

1. Jacob M, Avadhani RK, Nallathamby R, Soman MA, S. B. BODY DONATION AS GIFT TO MEDICAL SCIENCE FOR BETTER TOMORROW - LITERATURE REVIEW. J Health Allied Sci NU. 2015 Mar;05(01):108–10.

2. Riederer BM. Body donations today and tomorrow: What is best practice and why? Clin Anat. 2016 Jan;29(1):11–8.

3. Habicht JL, Kiessling C, Winkelmann A. Bodies for Anatomy Education in Medical Schools: An Overview of the Sources of Cadavers Worldwide. Acad Med. 2018 Sep;93(9):1293–300.

4. Department of Anatomy, Gujarat Adani Institute of Medical Sciences, Bhuj, Gujarat, India, Bala Ganesh KA, Panda P, Gurawa T, Department of Anatomy, C.U.Shah Medical college & Hospital, Surendranagar, Gujarat, India, Gopalakrishna PK, et al. Ethics on academic procurement of cadavers. Bioinformation. 2024 Aug 31;20(8):872–6.

5. Hildebrandt S, Champney TH. Ethical Considerations of Body Donation. In: Chan LK, Pawlina W, editors. Teaching Anatomy [Internet]. Cham: Springer International Publishing; 2020 [cited 2025 Apr 21]. p. 215–22. Available from: http://link.springer.com/10.1007/978-3-030-43283-6_23

6. Brenner E, Bleys RLAW, De Caro R, Catereniuc I, Chirculescu ARM, Destrieux C, et al. The legal and ethical framework governing body donation in Europe – 2nd update on current practice. Ann Anat - Anat Anz. 2024 Feb;252:152195.

7. Champney TH. The business of bodies: Ethical perspectives on for-profit body donation companies. Clin Anat. 2016 Jan;29(1):25–9.

8. Techataweewan N, Panthongviriyakul C, Toomsan Y, Mothong W, Kanla P, Chaichun A, et al. Human body donation in Thailand: Donors at Khon Kaen University. Ann Anat - Anat Anz. 2018 Mar;216:142–51.

9. Jenkin RA, Keay KA. Body donor programs in Australia and New Zealand: Current status and future opportunities. Anat Sci Educ. 2025 Mar;18(3):301–28.

10. Hemmerich WA. Normalverteilung online prüfen | StatistikGuru.de [Internet]. [cited 2025 May 9]. Available from: https://statistikguru.de/rechner/normalverteilung-rechner.html

11. Resident population at the beginning of the year [Internet]. 2021. Available from: https://osp.stat.gov.lt/statistiniu-rodikliu-analize?indicator=S3R167#/

12. Souza ASR, Amorim MMR, Melo ASDO, Delgado AM, Florêncio ACMCDC, Oliveira TVD, et al. General aspects of the COVID-19 pandemic. Rev Bras Saúde Materno Infant. 2021 Feb;21(suppl 1):29–45.

13. Manzanares-Céspedes M, Dalmau-Pastor M, Simon De Blas C, Vázquez-Osorio MT. Body Donation, Teaching, and Research in Dissection Rooms in Spain in Times of Covid-19. Anat Sci Educ. 2021 Sep;14(5):562–71.

14. Longhurst GJ, Stone DM, Dulohery K, Scully D, Campbell T, Smith CF. Strength, Weakness, Opportunity, Threat (SWOT) Analysis of the Adaptations to Anatomical Education in the United Kingdom and Republic of Ireland in Response to the Covid-19 Pandemic. Anat Sci Educ. 2020 May;13(3):301–11.

15. Pather N, Blyth P, Chapman JA, Dayal MR, Flack NAMS, Fogg QA, et al. Forced Disruption of Anatomy Education in Australia and New Zealand: An Acute Response to the Covid-19 Pandemic. Anat Sci Educ. 2020 May;13(3):284–300.

16. Ravi KS. Dead Body Management in Times of Covid-19 and its Potential Impact on the Availability of Cadavers for Medical Education in India. Anat Sci Educ. 2020 May;13(3):316–7.

17. Kalibatas V, Kalibatienė L, Imashpayev D. Blood donations and donors' profile in Lithuania: Trends for coming back after the COVID-19 outbreak. Aninagyei E, editor. PLOS ONE. 2024 Jan 25;19(1):e0297580.

18. Brañas-Garza P, Capraro V, Rascón-Ramírez E. Gender differences in altruism on Mechanical Turk: Expectations and actual behaviour. Econ Lett. 2018 Sep;170:19–23.

19. Xi J, Lee MT, Carter JR, Delgado D. Gender Differences in Purpose in Life: The Mediation Effect of Altruism. J Humanist Psychol. 2022 May;62(3):352–76.

20. Rand DG, Brescoll VL, Everett JAC, Capraro V, Barcelo H. Social heuristics and social roles: Intuition favors altruism for women but not for men. J Exp Psychol Gen. 2016 Apr;145(4):389–96.

21. Brañas-Garza P, Capraro V, Rascón-Ramírez E. Gender differences in altruism: Expectations, actual behaviour and accuracy of beliefs [Internet]. arXiv; 2016 [cited 2025 Apr 21]. Available from: https://arxiv.org/abs/1606.04900

22. 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 Nov;11(6):623–31.

23. Rochelle TL, Yeung DKY, Bond MH, Li LMW. Predictors of the gender gap in life expectancy across 54 nations. Psychol Health Med. 2015 Feb 17;20(2):129–38.

24. Schünemann J, Strulik H, Trimborn T. The gender gap in mortality: How much is explained by behavior? J Health Econ. 2017 Jul;54:79–90.

25. Kolip P, Lange C. Gender inequality and the gender gap in life expectancy in the European Union. Eur J Public Health. 2018 Oct 1;28(5):869–72.

26. Reducing poverty and social disparities in Lithuania [Internet]. 2020 Dec [cited 2025 May 3]. (OECD Economics Department Working Papers; vol. 1649). Report No.: 1649. Available from: https://www.oecd.org/en/publications/reducing-poverty-and-social-disparities-in-lithuania_b631de7d-en.html

27. Zarulli V, Kashnitsky I, Vaupel JW. Death rates at specific life stages mold the sex gap in life expectancy. Proc Natl Acad Sci. 2021 May 18;118(20):e2010588118.

28. Viljoen JK, Stephens S. Assessing the perceptions of individuals with differing levels and backgrounds of education towards whole-body donation. Ann Anat - Anat Anz. 2021 Jan;233:151604.

29. Lithuanian University of Health Sciences. Human Body Donation Program for Medical Sciene [Internet]. LSMU; 2025. Available from: https://lsmu.lt/en/about-lsmu/structure/medical-academy/institute-of-anatomy/human-body-donation-programme/