

ORIGINAL COMMUNICATION

# The state of anatomical donation programs amidst the SARS-CoV-2 (Covid-19) pandemic

Travis L. McCumber<sup>1</sup>  | Kimberly S. Latacha<sup>1</sup> | Carol S. Lomneth<sup>2</sup>

<sup>1</sup>Department of Genetics, Cell Biology and Anatomy, University of Nebraska Medical Center, Omaha, Nebraska

<sup>2</sup>Department of Medical Education, Creighton University School of Medicine, Omaha, Nebraska

## Correspondence

Travis L. McCumber, Department of Genetics, Cell Biology and Anatomy, University of Nebraska Medical Center, 986395 Nebraska Medical Center, Wittson Hall, Room 2002A, NE 68198.  
Email: travis.mccumber@unmc.edu

## Abstract

The inclusion of human body dissection in anatomical science curricula has been described as a critical educational experience for the mastery of anatomical structures and concepts. To ensure that body donors are ethically acquired and suitable for anatomy education, Anatomical Donation Programs (ADPs) are tasked with the responsibility of acquiring body donors for basic and clinical science curricula. Considering the personal and institutional impact of SARS-CoV-2, a national survey was conducted to examine the current effect of the pandemic on ADP protocols, body donation, and the sustainability of ADPs in the United States (U.S.). Eighty-nine U.S. ADPs were identified and contacted for optional participation in a survey to assess the impact of the SARS-CoV-2 pandemic on their programs. Survey data were collected and managed using REDCap electronic data capture tools. Thirty-six ADPs (40.5% response rate) from the nine U.S. Divisions are represented in the survey results. Data were collected on ADP descriptions and demographics, SARS-CoV-2 impact on ADPs and protocols, and body donation and ADP sustainability. Almost all ADPs reported that the pandemic has affected their ADP operations in some way; however, the sustainability for the majority of ADPs appears likely and donor availability remains stable due to a proportional decrease in body donations and body donor requests. As the long-term impact on ADPs has yet to be determined, the authors plan to reevaluate the lasting impact of the SARS-CoV-2 pandemic on body donation, ADP sustainability, and anatomical science education throughout the year 2021.

## KEYWORDS

anatomy education, cadaver, coronavirus COVID-19, deeded human body donor SARS-CoV-2

## 1 | INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), commonly referred to as COVID-19, has negatively affected the physical, emotional, and economic well-being of people worldwide. The viral pandemic drastically changed personal lives, work schedules, and the education of students across the spectrum. From elementary to professional education, many institutions abruptly transitioned to online learning platforms to reduce the transmission of the novel virus.

Anatomical science is a core discipline of many professional and pre-professional health science programs. Before the pandemic, a majority of health science programs included the dissection of human bodies as an essential instructional method. Human body dissection has been described as a critical educational experience for the mastery of anatomical structures, concepts, and spatial relationships (Aziz et al., 2002; Rizzolo & Stewart, 2006). Studies have shown the benefit and effectiveness of cadaveric dissection compared to computer-based and multimedia simulation resources (Khot

et al., 2013; Saltarelli et al., 2014), and Weeks et al. (1995) has suggested that the student encounter with a body donor reinforces respect and compassion, traits critical to student development and successful clinical practice.

State and/or institutional Anatomical Donation Programs (ADPs) are tasked with the responsibility of acquiring body donors for basic and clinical science curricula. To ensure that body donors are ethically acquired and suitable for anatomy education, ADPs develop and implement policies that address requirements for body donation and use of body donors. These requirements often set limitations on factors such as donor habitus (body mass index, BMI), cause of death, and infectious diseases (such as HIV/AIDS, hepatitis, or prion diseases). Acknowledging the personal and institutional impact of the SARS-CoV-2 pandemic and the worldwide spread of a novel infectious disease, a national survey was conducted to examine the current effect of the pandemic on ADP protocols, body donation, and the sustainability of ADPs in the United States (U.S.).

## 2 | MATERIALS AND METHODS

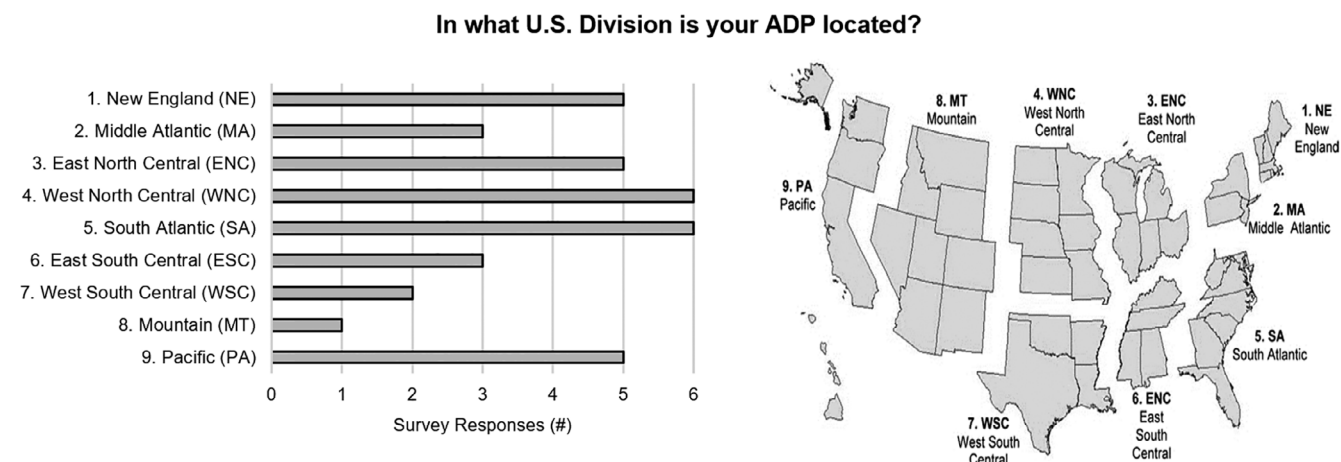
Using published ADP contacts and existing ADP consortiums, 89 U.S. ADPs were identified and contacted in July of 2020 for optional participation in a survey to assess the impact of the SARS-CoV-2 pandemic on their programs. The authors acknowledged that at the time of the survey, the uncertainty of the pandemic trajectory could potentially leave ADPs unable to confidently answer some of the survey questions. Therefore, a majority of survey questions were designed with an optional choice of “other” in an attempt eliminate skewing of the survey data. The choice of “other” subsequently prompted ADPs to provide an alternative answer; thus allowing, but not requiring, ADPs to provide a custom response. Survey data were collected and managed using REDCap electronic data capture tools hosted at the

University of Nebraska Medical Center (Harris et al., 2009; Harris et al., 2019). Service and support is provided by the Research Information Technology Office (RITO), which is funded by the Vice Chancellor for Research. Survey results are reported as a summative representation of ADP responses received by August of 2020. This study was deemed IRB exempt, University of Nebraska Medical Center IRB #494-20-EX.

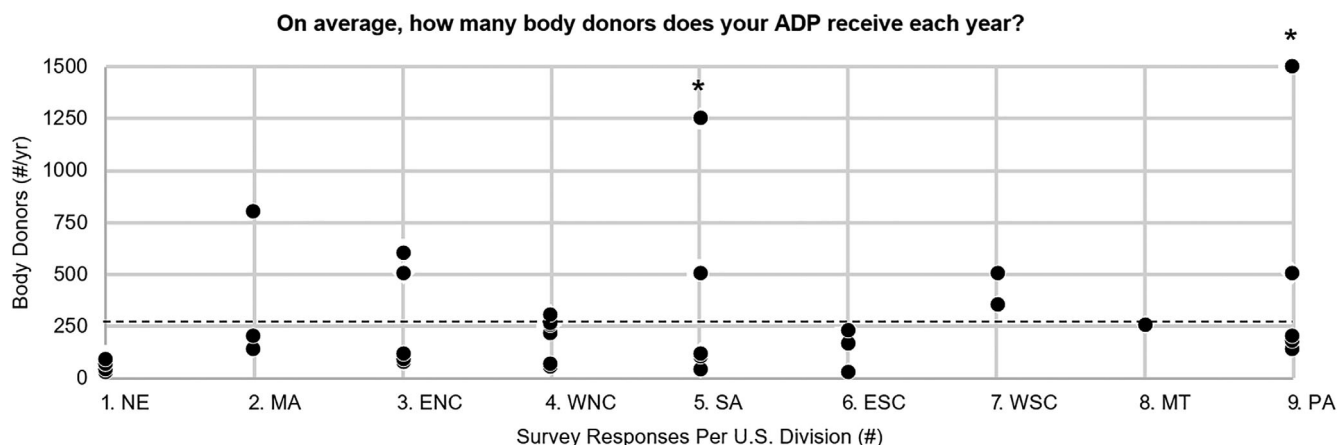
## 3 | RESULTS

### 3.1 | ADP descriptions and demographics

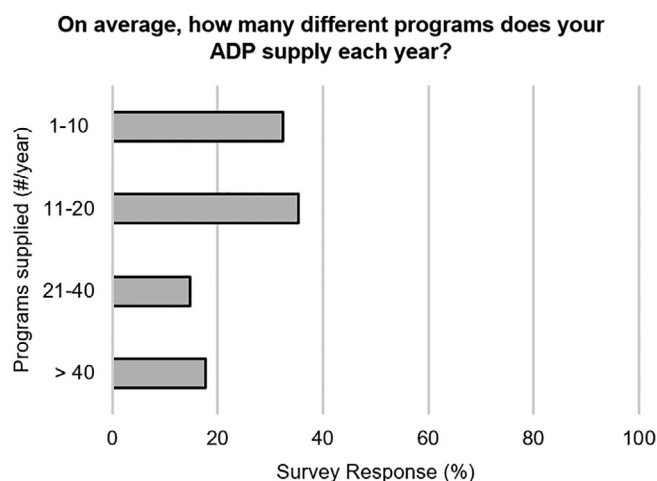
Thirty-six ADPs (40.5% response rate) from the nine U.S. Divisions participated and are represented in the survey results (“U.S. Census Divisions”, 2021). The highest number of responses received were from programs in the South Atlantic (6/36, 16.7%), West North Central (6/36, 16.7%), New England (5/36, 13.9%), East North Central (13.9%), and Pacific (5/36, 13.9%) divisions. The lowest number of responses were from West South Central (2/36, 5.6%) and Mountain (1/36, 2.8%) divisions (Figure 1). All of the ADPs reported an association with and oversight from an institutional and/or state anatomical board. Most of the ADP programs (25/36, 69.4%) were institutional programs while others were institutional programs with state anatomical board oversight (6/36, 16.7%) or were a state anatomical board program (5/36, 13.9%). The size of ADPs, based on the average number of body donors received in years prior to the pandemic, ranged from 32 to 1500 (mean = 283.9) donors. The majority of programs received 250 donors or less per year (Figure 2). Additionally, the number of programs ADPs supplied each year varied widely; however, most ADPs reported that 90% or more of the donors supplied were for anatomy education programs, opposed to anatomical research (Figures 3 and 4).



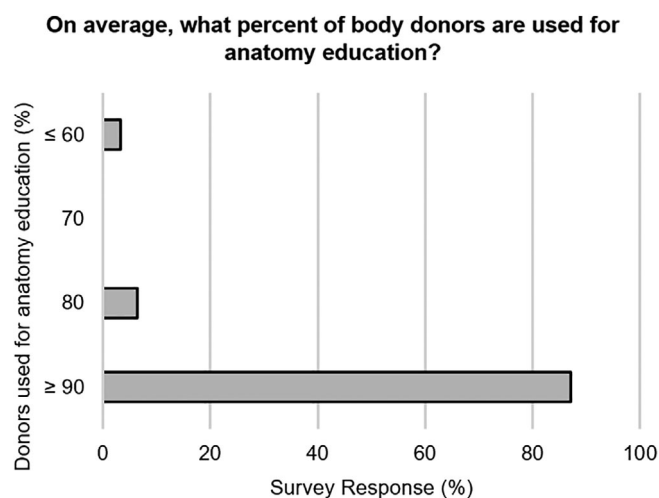
**FIGURE 1** Counts/frequency: 1. New England (NE) (5, 13.9%), 2. Middle Atlantic (MA) (3, 8.3%), 3. East North Central (ENC) (5, 13.9%), 4. West North Central (WNC) (6, 16.7%), 5. South Atlantic (SA) (6, 16.7%), 6. East South Central (ESC) (3, 8.3%), 7. West South Central (WSC) (2, 5.6%), 8. Mountain (MT) (1, 2.8%), 9. Pacific (PA) (5, 13.9%)



**FIGURE 2** Counts/frequency: 1. New England (NE) (32, 40, 64, 65, 100), 2. Middle Atlantic (MA) (150, 200, 800), 3. East North Central (ENC) (80, 100, 120, 500, 600), 4. West North Central (WNC) (52, 70, 220, 250, 270, 300), 5. South Atlantic (SA) (50, 108, 115, 125, 500, 1250), 6. East South Central (ESC) (35, 165, 230), 7. West South Central (WSC) (350, 500), 8. Mountain (MT) (250), 9. Pacific (PA) (150, 180, 200, 500, 1500). Mean (283.9, dashed line), Min (32), Max (1500), StDev (325.6),  $>2 \times \text{StDev}$  (\*)



**FIGURE 3** Counts/frequency: 1-10 (11, 32.4%), 11-20 (12, 35.3%), 21-40 (5, 14.6%), >40 (6, 17.6%)



**FIGURE 4** Counts/frequency: ≤60 (1, 3.2%), 70 (0, 0.0%), 80 (2, 6.5%), ≥90 (27, 87.1%)

### 3.2 | SARS-CoV-2 impact on ADPs and protocols

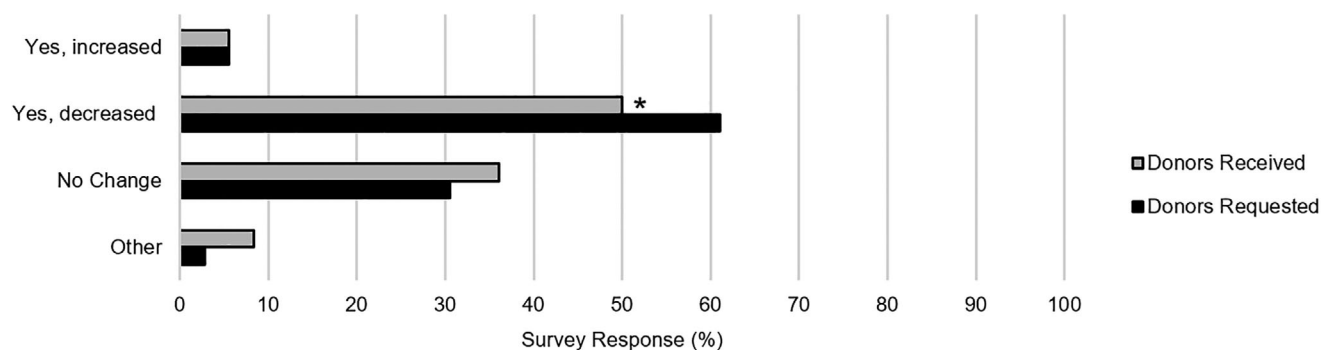
Most ADPs (33/36, 97.1%) were affected by the pandemic with only 8.3% (3/36) of the ADPs reporting no effect on their program. A majority of ADPs (29/36, 80.6%) noted that their ADP facility or institution was under a “shelter in place” or “safer at home” order at the time of the survey completion. Nevertheless, 83.3% (30/36) of ADPs reported that ADP personnel were considered essential workers during these shelter orders and were allowed to continue ADP operations. No ADPs reported layoffs or furloughs of ADP staff; however, this was not directly assessed in the survey. Many of the ADPs (26/36, 72.2%) continued to accept donors during the pandemic while 25% (9/36) of responding ADPs did not. Of those programs accepting body donors, 88.5% (23/26) used a SARS-CoV-2 screening protocol for potential body donors and 77.8% (21/27) declined a donation based on the implementation of SARS-CoV-2

screening protocols. A quarter (7/27, 25.9%) of programs accepting donors reported the use of diagnostic assays to test body donors for SARS-CoV-2, while 77.8% (21/27) of ADPs developed and implemented additional handling and embalming precautions alongside standard precaution procedures.

### 3.3 | Body donation and ADP sustainability

Half (18/36) of ADPs reported a decrease in the number of body donations while 36.1% (13/36) reported no change. Seven of the 18 (38.9%) ADPs who reported a decrease in the number of body donations, noted that this was due to the ADP ceasing acceptance of body donors. Only 5.6% (2/36) of ADPs reported an increase in body donations. A majority of ADPs reported an overall decrease (22/36, 61.1%) in the number of requests for use of body donors with only

### Has the number of body donors received by your ADP and the number of requests to your ADP for body donors changed during the pandemic?



**FIGURE 5** Counts/frequency: *Donors received*: Yes, increased (2, 5.6%), yes, decreased (18, 50.0%), no change (13, 36.1%), other (3, 8.3%). Decreased due to ceasing acceptance (7/18,\*). *Donors requested*: Yes, increased (2, 5.6%), yes, decreased (22, 61.1%), no change (11, 30.6%), other (1, 2.8%)

5.6% (2/36) of ADPs reporting an increase and 30.6% (11/36) of ADPs reporting no change in the number of requests (Figure 5). Most programs (27/36, 75%) continued to fulfill requests for body donors during the pandemic while 25% (9/36) of the ADP programs did not. Of those ADPs that did not fulfill request during the pandemic, 66.7% (6/9) of ADPs reported that this was due to lack of requests received or requests previously received being canceled. While only a small proportion of body donors supplied by the reporting ADPs were assigned to clinical and research programs, 72.2% of ADPs (26/36) reported that educational, clinical, and research programs were affected equally by pandemic induced limitations. The current status of the donor supply either increased or did not change for 41.7% (15/36) or 25.0% (9/36) of the ADPs, respectively. A decrease in the current status of donor supply was reported by 27.8% (10/36) of ADPs. When asked about the potential effect of the pandemic on the cost of supplying donors to programs, 13.9% (5/36) of ADPs anticipated an increase in cost while 61.1% (22/36) anticipated no change in cost of supplying donors. A quarter (9/36, 25%) of ADPs responded to this survey question by selecting the “other” option, as the uncertainty of the pandemic trajectory at the time of the survey completion left the ADP unable to confidently answer the question. When asked about the potential effect of the pandemic on the long-term sustainability of their ADP, 72.2% (26/36) of ADPs did not anticipate an impact on long-term sustainability while 27.8% (10/36) anticipated potential impact on long-term sustainability.

## 4 | DISCUSSION

The SARS-CoV-2 pandemic has affected people and institutions worldwide. Not unexpectedly, almost all ADPs reported that the pandemic has affected their ADP operations in some way. Nevertheless, most ADP personnel were considered essential workers and were allowed to continue ADP operations. Normal ADP operations were also affected by the pandemic in that the majority of ADPs

developed additional procedures, including the development and implementation of screening protocols as well as advanced safety measures for processing, handling, and embalming of body donors.

Anatomical science education using cadaveric dissection is dependent on not-for-profit ADPs to maintain a sustainable supply of body donors which requires balancing the supply of bodies donated with the requests for use. A majority of the ADPs that accepted body donors did so only after the implementation of a SARS-CoV-2 screening process, and half of ADPs reported a decrease in the number of body donors received. The development and implementation of screening protocols were variable in depth and rigor, using a variety of screening questions that assessed confirmed SARS-CoV-2 tests, close contact with an individual with a confirmed SARS-CoV-2 test, and/or recent international travel. While the use of SARS-CoV-2 diagnostic assays to test body donors received by ADPs was minimal, ADPs using diagnostic assays aligned the handling of positive SARS-CoV-2 assay results with their infectious disease policies. These proactive risk-benefit policies often exclude body donors for being assigned to educational programs.

While ADP limitations and screening protocols reduced the number of accepted donations, this reduction was proportional to the reduced number of requests for body donors. Physical distancing requirements recommended by the Center for Disease Control (CDC) did not align with the ability of many programs to maintain the laboratory component of their curricula. Therefore, the number of body donors used for cadaveric dissection was impacted as anatomy programs abruptly transitioned to online learning platforms. The closure of on-campus events across the U.S. limited the ability of anatomy education programs to use one of their most valuable resources, human body donors. In addition, similar clinical and research limitations eliminated the ability of ADPs to increase body donor assignment for clinical and research programs in response to the reduced requests from anatomy education programs.

This survey, distributed amidst the pandemic, aimed to assess the current environment and future sustainability of body donation and ADPs within the United States. While emerging vaccination efforts

have provided hope for protection against the novel virus, the authors acknowledge that the SARS-CoV-2 pandemic continues to affect people and institutions worldwide. With a promising outlook on containment, the sustainability for the majority of ADPs appears likely. Current donor availability remains stable due to a proportional decrease in body donations and body donor requests. However, a considerable number of ADPs stated that increased operational costs associated with personal protective equipment (PPE) and SARS-CoV-2 diagnostic testing could result in an increase in fees for use of the body donors. At the time of the survey, the uncertainty of the pandemic trajectory left multiple ADPs unable to determine the potential financial impact. Additionally, it is important to note and recognize that body donors and the families of body donors were also impacted by the pandemic. While individuals pre-registered as body donors and families of body donors were not surveyed as part of this study, we can speculate that many individuals, who may have planned the bequeathal of their body decades prior, must have had to seek alternative options to honor the wishes and selfless action of body donation. As the long-term impact and recovery of ADPs are yet to be determined, the authors plan to reevaluate the lasting impact of the SARS-CoV-2 pandemic on body donation, ADP sustainability, and anatomical science education throughout the year 2021.

## ACKNOWLEDGMENTS

The authors would like to thank Megan Brown MS, MEd (University of Nebraska Medical Center; Omaha, NE) for her assistance with REDCap electronic data capture tools; and Brandi Schmitt, MS (University of California; Oakland, CA) for her assistance with U.S. ADP identification. The authors would also like to thank anatomical body donors for graciously donating their bodies for the continued advancement of anatomical education and research.

## ORCID

Travis L. McCumber  <https://orcid.org/0000-0002-3835-3827>

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**How to cite this article:** McCumber, T. L., Latacha, K. S., & Lomneth, C. S. (2021). The state of anatomical donation programs amidst the SARS-CoV-2 (Covid-19) pandemic. *Clinical Anatomy*, 34(6), 961–965. <https://doi.org/10.1002/ca.23760>