Analyzing Politics Final Project

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1 Introduction

Every December, St. Olaf hosts the St. Olaf Christmas Festival. This massive celebration is a campus wide event, featuring the premiere orchestra and five choirs. In total, nearly 15% of the student population participates. The program features around two hours of music, including solo pieces, mass choir pieces, hymns, and ending with "Beautiful Savior". During the preparation phase, there is much informal talk among students assessing the various pieces, but to date no one has measured student sentiment about the music they perform.

2 Question

Broadly, the purpose of this research is to analyze student sentiment about Christmas Festival pieces. To do this, I will try to use regression to produce a model to predict student ratings of songs. However, since song ratings is highly subjective, I have also, in consultation with existing literature about the Christmas Festival, developed several testable hypotheses about student song sentiments:

- First, I suspect that there will be some self-preference; that is, that members of a given ensemble will rate their solo pieces slightly more highly than the other singers.
- Second, I believe that there will be a small association between opinion of a mass choir piece, and whether a given singer is a member of an ensemble conducted by the conductor of that particular piece.
- Third, I believe that a capella pieces will be rated more highly than fully accompanied songs.
- Fourth, I believe that songs by underrepresented composers will be at least as popular as songs by white men.
- Fifth, I think that songs that have been written or arranged by St. Olaf faculty or alumni will prove to be more popular than songs written by others.

- Finally, I do not believe there will be significant difference in sentiment between various voice parts, controlling for ensemble.

3 Literature Review

Existing literature on the St. Olaf Christmas Festival is exceptionally scarce. One of the only sources to talk about the Festival in length was Margaret Gurtcheff's doctoral dissertation, "An Examination and Analysis of Four Collegiate Holiday Programs: St. Olaf College's Christmas Festival, Emory University's Festival of Nine Lessons and Carols, Florida State University's Seasonal Celebration, and the University of Kentucky's Holiday Collage." This source provided a brief overview of the St. Olaf Christmas Festival tradition, but also a lot of details on the immensely intricate planning that goes on. It talks about the form that Festival rosters are made, and from this discussion came two of the research questions- those about underrepresented composers and St. Olaf faculty / alumni composers. It also discussed the campus environment during the festival, and a lot of other general information about the Christmas Festival experience.

The second source I came across was the doctoral dissertation of Anton Armstrong, the current conductor of the St. Olaf Choir and the artistic director of the Christmas Festival. This source had the shortest section on the Christmas Festival (being primarily devoted to the history of St. Olaf Choir). Additionally, because of the source's age, certain aesthetic and artistic details have changed. It does provide a nice contrast with the two more modern accounts of the Festival.

The final source I found was "The St. Olaf Choir: A Narrative" by Joseph Shaw. This source provided the most in-depth history of the Christmas Festival, which though interesting were of little relevance to the specifics of this project. The later sections were more useful, talking about the adaptations to the program that have produced the modern Christmas Fest described by Dr. Gurtcheff's dissertation. The discussions of the myriad changes which Beautiful Savior has undergone over the years helped inspire the hypothesis that a capella songs were more highly favored than accompanied songs.

4 Data / Methodology

This past November, I sent out a survey to all current Christmas Fest participants, which asked them to rate the songs of whichever of the past three Christmas Festivals they attended. Figures 13-16 in the appendix show demographic summaries from the Google Form the survey was on, summarizing the breakdown of the responses for each year by choir and voice part. In total, I received around 150 responses, and this dataset will provide the means to answer

my hypothesis questions. In addition to rating the relevant songs, I gathered information about the voice part, choir, and field of study of each student; I did not end up using field of study. The songs were rated on a categorical scale of "F" to "S+", which I converted to a numerical scale from 0-6 for analysis. Specifically, the letter grades "A"-"F" (excluding "E") were made intentionally to resemble school grades; I added two categories "S" and "S+" to give extra precision to the top rankings, so there are not simply a lot of "A"s which are difficult to distinguish from one another. In each case, students were only asked to rate songs which they knew, so there is more data for more recent songs, and in particular there is more data for mass choir pieces than solo pieces, since most people filled out the survey before they heard other ensembles' solo pieces.

I also made a list of the songs from the past Christmas Festival, and compiled information about them, including its year, performers, and a couple other metrics specific to my research questions: whether the song was a capella, whether it was written by a composer from an underrepresented community, and whether it was written or arranged by a St. Olaf faculty or alum. I used the program notes from the past three festivals for this task. One of the variables I created for this project is called SongCategory. I sorted each of the songs as "ORCH" for Orchestra solo pieces, "SOLO" for choral solo pieces, "MED" for the medley piece (one song each fest where each choir has a solo section), "HYMN" for the hymns sung with audience participation, and "MASS" for the massed choir songs, with or without orchestral accompaniment (There is usually one or perhaps two massed choir songs each year without orchestral accompaniment).

5 Analysis

We will look at each of my hypotheses

5.1 Self-Preference

To analyze self-preference, I compared the average ratings of each ensemble's solo pieces, across all of the years, to the average rating it gave every other ensemble. From Figure 1, every ensemble had a higher preference for their own solo pieces except Manitou Singers.

After calculating the statistics shown, I performed a two-sample t-test. I got a confidence interval of $[-1.1971482 - 0.2621967]$, and a p-value of 0.007241, so I have statistically significant evidence that St. Olaf Christmas fest participants prefer their own solo pieces to other ensembles'.

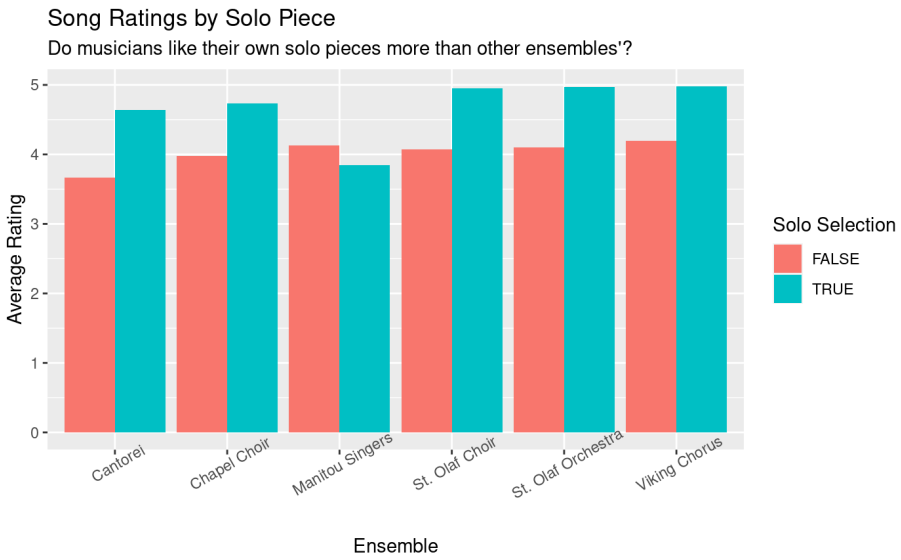

Figure 1: Ensemble Solo Preferences

5.2 Conductor Preference

A second, closely related question is whether student musicians will prefer songs conducted by their conductor, in general. This includes their solo pieces, but also mass choir pieces, hymns, and all of the other music conducted by their ensemble's director. Compared to the last research question, the difference between preference of one's own music and others' is less pronounced, which is probably a result of the wider variety of music represented by including all of the music, not just the solo pieces. Running a similar test yields a p-value of $2.435*10^{-8}$. Part of the reason that the p-value for this test is so much smaller than for Self-Preference is the much larger sample size, including all Fest songs and not just solo pieces. This gives very strong evidence of an association between a student's opinion of a piece, and whether it is conducted by his or her ensemble's conductor.

5.3 A Capella

My third category of analysis has to do with a capella songs: Songs without tonal, instrumental accompaniment (for the purposes of this analysis, rhythmic, non-tonal percussion instruments like drums do not count as instrumental accompaniment). To compile a list of which songs were a capella, I used the program notes, as well as the Spotify records of the past two Christmas Festivals. Figure 3 shows the average ratings of songs in the two categories, as well as the Orchestra solo pieces (which have no vocal parts and therefore fit into neither category).

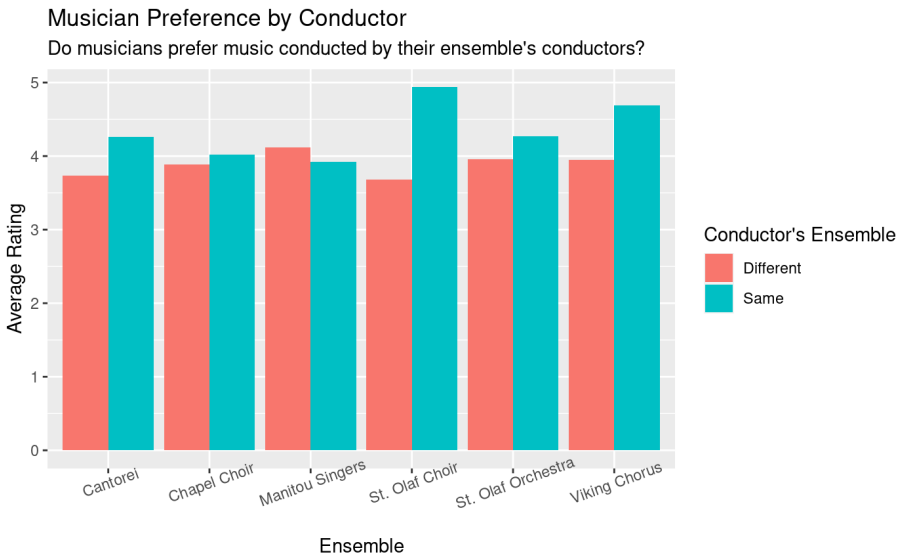

Figure 2: Music Preference by Ensemble Conductor

My hypothesis is that a capella songs would be rated more highly than accompanied songs. The 95% confidence interval given for the difference in average rating between accompanied and a capella songs is [-0.8102764 -0.6435807], and the p-value is less than $2.2 * 10^{-16}$. Therefore, I have extremely strong significance that a capella music is preferred to accompanied music.

5.4 Underrepresented Composers

My fourth category of analysis is Underrepresented Composers. In recent years, there has been a concerted effort by Christmas Fest program planners to increase the diversity of music by seeking out songs written by historically underrepresented composers, generally women, LGBT, and minorities (Gurtcheff, 2022). These selections have been generally popular with the student body, and so I hypothesized that the songs by underrepresented composers would be at least as popular as songs by straight white men.

My analysis showed a slight preference for songs by underrepresented composers, with an average rating of 4.101598, as opposed to 3.957607 for more represented composers. A two sample t-test yields a p-value of 0.008037, so we have significant evidence that music by underrepresented composers is preferred to music by straight white men.

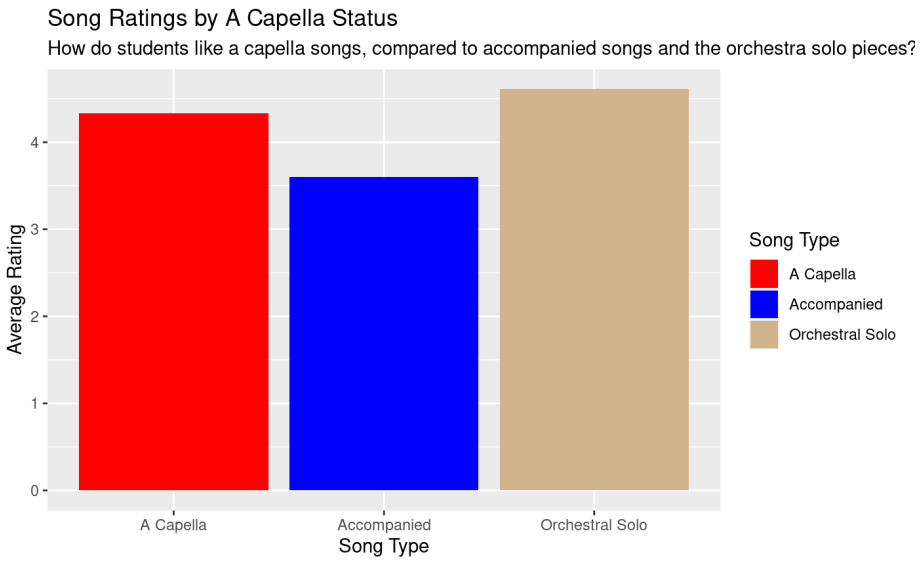

Figure 3: Music Preference by Accompaniment Status

5.5 St. Olaf Composers

My fifth category of analysis concerns music arranged by St. Olaf composers. Many of the traditions in the Christmas Festival program creation involve pieces written or arranged by St. Olaf faculty or alumni. Examples of this include the inclusion of a piece by F. Melius Christansen, a medley piece typically written or arranged by a St. Olaf faculty member, and most famously the ending of each Festival with Beautiful Saviour, also arranged by F. Melius Christansen (Shaw, 1997). The F. Melius pieces and Beautiful Savior, in particular are often popular among students.

However, in this case the data did not affirm my hypothesis. The average rating for a St. Olaf composed song was 3.958611, as opposed to the average rating of 4.004964 for the other pieces in the programs. However, performing a two-sample t-test yielded a p-value of 0.2782, meaning that these results are not statistically significant. Therefore, we have no evidence for a preference either way.

5.6 Voice Parts

My final specific hypothesis is that there would be no significant association between voice part and rating of songs. This hypothesis was based on the lack of mention of voice part in any of the literature surveyed, as well as anecdotal evidence of a lack of observation or reference to any voice-based preferences.

To measure this, I performed a χ^2 test for association between the rating given (treated as a categorical variable), and voice part. This test resulted in

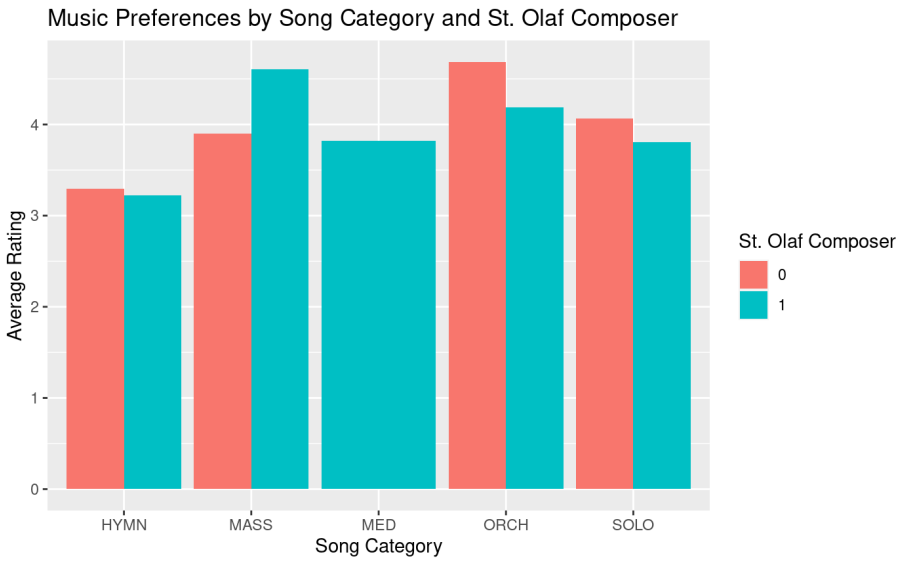

Figure 4: Music Preference by Category and St. Olaf Composer

a χ^2 statistic of 189.45, which with 54 degrees of freedom results in a p-value of $< 2.2 * 10^{-16}$, an exceptionally significant result. Figure 5 shows the average rating of each voice part, which is quite remarkable given the large sample size, and the lack of any factor which would have an obvious impact across three Christmas Festivals.

6 Regression Modelling

Linear modelling was difficult for this project, because my response variable was numeric and categorical, which meant that either linear or logistic regression would have challenges. For the linear model, there is a significant danger of escaping the range of the categorical variables, since they only are defined from 0-6, and there are many predictors with coefficients with absolute value of 1 or even higher. For logistic regression, the main challenge was to create a binary variable which most accurately captured the range of possible responses. I decided to create an indicator variable for Rating$>$ 3, splitting the ratings of 4,5, and 6 from those of 0,1,2, and 3. However, this is a highly imperfect solution, since much of the nuance within the answers is lost.

Creating models with the relevant predictors (StOlafComposer, ACapella, Underrepresented, Year, SongCategory, Choir, Voice, Conductor, and year of first Fest) generated a linear model with an R-Squared of 0.144, and the logistic model decreased deviance by only 0.07732563. In each of these models, most indicator variables were not significant.

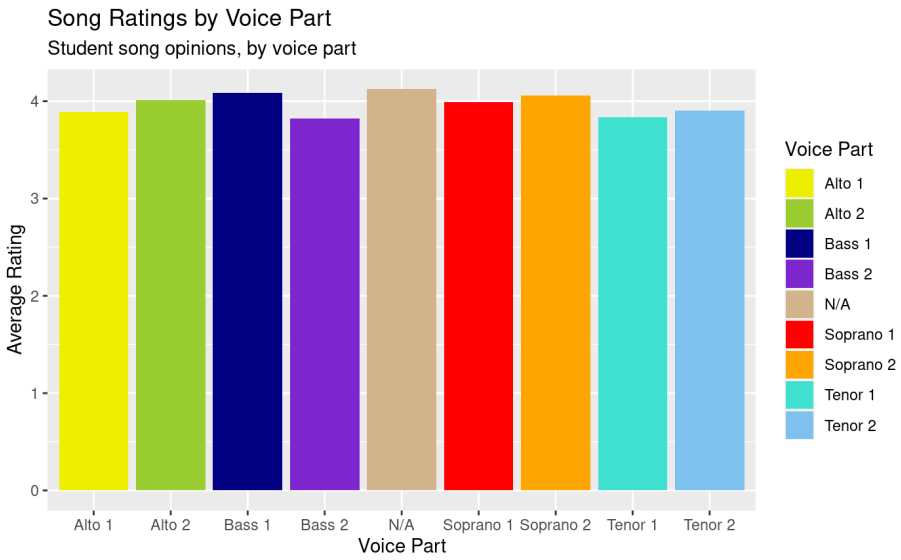

Figure 5: Music Preference by Voice Part

Therefore, I decided to break up each of these models into three models, one for each year of Christmas Fest, in the hopes that this would increase significance of the model. Incidentally, this is functionally equivalent to simply adding interaction terms to the original models, but for the sake of simplicity I decided to split up the models.

In each of the three models, I still had a large number of insignificant predictors, but the overall proportion of significant predictors was noticeably higher. Importantly, the linear model produced R-Squared values of 0.2446, 0.2899, and 0.2181, for the years 2021, 2022, and 2023 respectively. Conversely, the logistic model produced drops in deviance of 0.1492075, 0.1768151, and 0.1417183, respectively. The full models are located in the appendix.

7 Discussion

In conclusion, I partially succeeded in my task of characterizing the participant sentiment regarding Christmas Festival songs for the past few years. In a survey I sent out to St. Olaf music students involved in Fest, I compiled a dataset consisting of 151 responses. From this dataset, I found statistically significant evidence to support my hypotheses that students have preference for their own solo pieces, pieces conducted by their ensemble's conductor, a capella music, and music by underrepresented composers. Regarding the hypothesized preference for music by St. Olaf composers, the data was inconclusive, although it

did indicate a preference for non-St. Olaf composers. Finally, my hypothesis that there would be no association between voice part and music preference was very wrong; the data showed a very strong relationship.

The regression models did not prove to be very effective, and even when separated by year, no model had an R-squared greater than 0.3. I considered using StepAIC (an RStudio model finding algorithm) to reduce the number of predictors in my model (as many were not significant), but the (surprisingly) small difference between R-Squared and Adjusted R-Squared in each of the models convinced me that such a model would not be enough of an improvement to justify inclusion here. As one can see from the model summaries in the appendix, many of the significant variables were specific songs; therefore, despite factors like voice part and choir having statistically significant differences by itself, those factors do not always improve the model enough to justify their own statistical significance.

One thing I wanted to do was to calculate VIF (Variance Inflation Factor) to try to see which variables had significant collinearity; considering the number of variables, and the interrelated nature of many of the variables, I felt like this was quite likely. However, given the size of all of the models, this felt infeasible, and I did not think that it would provide sufficient insights to justify the clutter.

One transformation I performed on R but did not use in any of the analysis here was centering the observations by individual, to sift out only the relative changes among songs without conflating an individual's natural tendency to rate all songs lowly or (more often the case) highly. Although statistically compelling to use, I found that the negative effect on interpretability would make this transformation harder to explain than it would justify. Although not affecting song rankings much overall, the top rankings for songs did get shuffled around a little bit, so that was interesting to see. The centered mean rankings were included in Figures 10-12.

Further down that path, although my dataset was large it was not as representative as it could be. I briefly considered a transformation to weigh each observation in proportion to the population proportions (for any given comparison) to change the proportions in the sample to the proportions present in the ensembles in each of the years. However, this would be quite an intensive undertaking, and I am doubtful that the sample size of merely 150 people would justify such an intensive transformations for such marginal gains.

8 Annotated Bibliography:

- Gurtcheff, Margaret (Meg). "An Examination and Analysis of Four Collegiate Holiday Programs: St. Olaf College's Christmas Festival, Emory University's Festival of Nine Lessons and Carols, Florida State University's

Seasonal Celebration, and the University of Kentucky's Holiday Collage." Doctoral dissertation, University of Kentucky, 2022.

  - AN EXAMINATION AND ANALYSIS OF FOUR COLLEGIATE HOLIDAY PROGRAMS: https://web.archive.org/web/20220528035646id_/https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1219&context=music_etds

  - https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1219&context=music_etds

- Armstrong, Anton Eugene. "CELEBRATING 75 YEARS OF MUSICAL EXCELLENCE: THE EVOLUTION OF THE ST. OLAF CHOIR." Doctoral dissertation, Michigan State University, May 1987, pages 75-76. St. Olaf Choir writing for doctoral thesis- Anton Armstrong

- Shaw, Joseph M., The St. Olaf Choir: A Narrative, 1997 (592-603).

- Fest 2023 Program Notes:

  https://drive.google.com/file/d/1lz6QZF157TxfCYBmtXvqr_EqgAbPFHoo/view

- Fest 2022 Program Notes:

  https://drive.google.com/file/d/1FkL8fiJVBibKH3mi6CpLuSW0JYogNP0I/view

- Fest 2021 Program Notes:

  https://www.stolaf.edu/multimedia/streams/programs/2021/2021-12-05_fest_program_notes.pdf

- Love Divine (2021) Spotify Playlist

  https://open.spotify.com/album/5hpG1M54u6vLaQ42Atyf5a?si=Aza07hJLSvCr4AacxWJ_PQ

- Promise of Peace (2022) Spotify Playlist

  https://open.spotify.com/album/2os0rr1xWcV0PNjGAuo7l6?si=wlaS0IGKTO6ZZDr_G4C2yw

9 Appendix

This is a compilation of figures that I created during my research, but were too long to include in the body of the report. Note that the standard deviations in Figures 10-12 refer to the uncentralized Song Means (Because the songs were centered around respondent means, not the song means, the standard deviation will be slightly different for the centralized song means.

In Figure 6, the average rating of songs conducted by each director are listed. SMA is Steven Anderson, JBOBB is Prof. Jamie Bobb, PARK is Dr. Chung Park, and each other entry is the first name of the choir conductor.

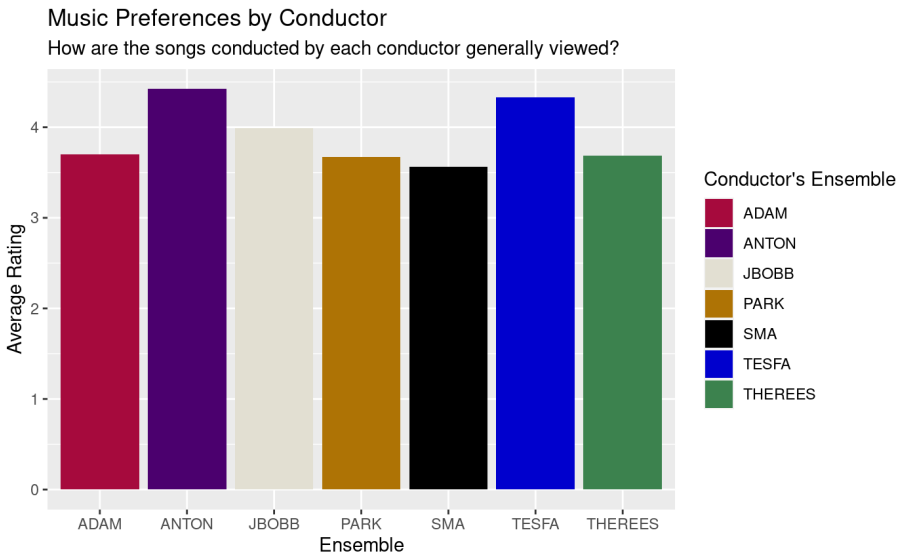

Figure 6: Student Preference by Song Conductors

Variable <chr>	Lin2021 <dbl>	Lin2021Sig <dbl>	Log2021 <dbl>	Log2021Sig <dbl>
(Intercept)	3.402380596	4.108367e-42	-0.19864535	6.129374e-01
SongAngelsDance	0.811786137	4.354556e-03	1.11527633	1.503120e-02
SongBeautSav2021	1.874854036	3.475133e-11	2.69841807	2.618603e-06
SongCarolAdvent	0.136015226	6.356072e-01	0.51937624	2.472875e-01
SongCarolForChoirs	0.672931828	1.846402e-02	1.09858959	1.532160e-02
SongChristusNatusEst	1.744360399	1.309249e-09	3.21846416	2.319905e-06
SongDeepUnboundedDarkness	0.720550875	1.165351e-02	1.42444536	2.171805e-03
SongGloria2021	1.126096114	9.625371e-05	1.50905810	1.723162e-03
SongGodisLove	-0.565163410	4.775478e-02	-0.59617057	2.189253e-01
SongGodRestMerryGentlemen	0.047490698	8.692440e-01	0.43908232	3.338086e-01
SongGodsLoveMadeVisible	-0.422306268	1.389461e-01	-0.34369253	4.643079e-01
SongGoodChristianFriendsRejoice	-0.636475154	2.493051e-02	-0.51034926	2.830023e-01
SongHolyChild	-0.024318624	9.342811e-01	0.12975941	7.833939e-01
SongInSilentNight	0.981040157	5.231007e-04	1.28632775	4.965598e-03
SongLightDawns	0.619338800	2.909271e-02	1.02528709	2.235277e-02
SongLlegaNavidad	0.300158230	2.910308e-01	0.59236400	1.874745e-01
SongLoHowARose	0.109503725	7.042194e-01	0.31718008	4.852075e-01
SongLoveCameDown	-0.086366538	7.621644e-01	-0.20222331	6.606669e-01
SongLoveDivine	0.223989962	4.295668e-01	0.24867555	5.776595e-01
SongMaryBoyChile	0.891164373	1.840826e-03	1.71761174	4.138805e-04
SongMountofOlives	0.363636364	1.971834e-01	0.67045725	1.289882e-01
SongNimrod	1.548888120	4.422681e-08	1.77373376	2.646031e-04
SongNuncDimittis	1.549571358	5.616363e-08	2.45326248	7.136748e-06
SongPast3Clock	0.385965147	1.687140e-01	0.61231752	1.631902e-01
SongPraiseLord	1.268169923	9.564437e-06	2.25009330	1.867016e-05
SongRachmoninov	0.879007797	1.992262e-03	1.15244457	1.138623e-02
SongSilentNight	1.536627912	9.270080e-08	2.31766048	2.452874e-05
SongTellOnMountain	-0.234938978	4.241553e-01	0.14147948	7.632812e-01
Choir21Chapel Choir	-0.394780252	3.164887e-02	-0.58532573	6.363410e-02
Choir21Manitou Singers	-0.228278112	1.118201e-01	-0.66407754	7.647704e-03
Choir21St. Olaf Choir	-0.309966911	1.371801e-01	-1.00126739	5.671668e-03
Choir21St. Olaf Orchestra	0.229187785	2.189710e-01	0.07272094	8.234059e-01
Choir21Viking Chorus	-0.644173357	2.827963e-03	-0.68383113	6.237887e-02
SoloChoirTRUE	0.611411036	2.112822e-04	1.19813010	5.155062e-01
Voice21Alto 2	0.091464671	4.955280e-01	0.15636773	9.320187e-05
Voice21Bass 1	0.420856232	4.783077e-02	0.37017598	4.898498e-01
Voice21Bass 2	0.007785188	9.722309e-01	-0.52750033	3.069066e-01
Voice21Soprano 1	0.363732833	6.203697e-03	0.59340855	1.647376e-01
Voice21Soprano 2	-0.128554596	3.922941e-01	-0.03971761	8.879727e-03
Voice21Tenor 1	0.132956224	5.524609e-01	0.19282008	8.747240e-01
Voice21Tenor 2	0.633064179	5.861824e-02	0.36992785	6.207376e-01

1–41 of 41 rows

Figure 7: 2021 Models

Description: df [36 × 5]

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SongAwakeHarp	0.91428571	2.051977e-05	1.54060677	2.822242e-05
SongBeautSav2022	2.13093301	7.748189e-23	2.86148011	1.536326e-09
SongCarolBells	1.25096215	1.209160e-08	1.65237046	1.873932e-05
SongCarolofStranger	1.98996950	6.967043e-20	2.42127650	1.485464e-08
SongDayPeace12	-0.07733351	7.228976e-01	-0.69382065	7.895954e-02
SongDonaNobisPacem	1.51428571	2.303962e-12	1.84736114	1.393055e-06
SongEarthStrikeMusic	0.90434534	4.431884e-05	1.18382123	1.529629e-03
SongHarkHeraldAngels	0.40079927	5.943590e-02	0.66224632	5.650457e-02
SongHeartWorships	0.69774315	1.233056e-03	0.85386526	1.564859e-02
SongHodieChristus22	0.15544780	4.771414e-01	0.18794937	6.071277e-01
SongKeepYourLamps	1.08624925	8.871403e-07	1.73386572	1.076792e-05
SongLittleLightMine	0.86587341	7.421215e-05	1.01420380	5.578487e-03
SongMidnightClear	0.26390484	2.176463e-01	0.32146518	3.599345e-01
SongOrchNoel	0.93066987	1.922328e-05	1.54925384	4.072214e-05
SongOvertureNutcracker	2.28758249	7.984620e-25	3.31830558	9.125195e-09
SongPsalm50	1.52857143	1.444354e-12	2.21343433	5.687862e-08
SongSirChristemas	-0.32494685	1.276575e-01	-0.21517447	5.516717e-01
SongSongofPeace	0.75771633	6.575908e-04	1.10000842	3.000951e-03
SongStayWithUs	1.29529432	2.065187e-09	2.10740610	1.437903e-07
SongWillMakeWay	1.50725483	1.212188e-11	2.00256892	1.314826e-06
Choir22Chapel Choir	0.39463008	6.732135e-04	0.24751103	2.460111e-01
Choir22Manitou Singers	0.28886657	1.561280e-02	0.34836251	1.152907e-01
Choir22Other (Audience member)	1.06811769	2.706458e-01	11.75511348	9.730704e-01
Choir22St. Olaf Choir	0.03545205	7.752583e-01	-0.35904283	1.080553e-01
Choir22St. Olaf Orchestra	-0.36225285	2.852223e-01	-0.81901180	1.803197e-01
Choir22Viking Chorus	0.36843581	1.112791e-02	0.27961977	2.967604e-01
SoloChoirTRUE	0.52782169	1.466118e-04	0.85373416	2.674279e-03
Voice22Alto 2	0.10775499	3.878219e-01	0.06918593	7.614591e-01
Voice22Bass 1	0.14165933	3.840151e-01	0.28740751	3.389380e-01
Voice22Bass 2	0.18042910	2.754325e-01	-0.05864129	8.447031e-01
Voice22N/A	0.74984747	3.982748e-02	0.91829069	1.634817e-01
Voice22Soprano 1	0.33539735	1.812677e-02	0.24780646	3.435304e-01
Voice22Soprano 2	0.16614067	1.863555e-01	0.19651204	3.962124e-01
Voice22Tenor 1	0.11429280	6.074779e-01	-0.38143972	3.333754e-01
Voice22Tenor 2	0.19599021	3.456248e-01	0.14868014	7.002949e-01

1–36 of 36 rows

Figure 8: 2022 Models

Description: df [37 × 5]

Variable <chr>	Lin2023 <dbl>	Lin2023Sig <dbl>	Log2023 <dbl>	Log2023Sig <dbl>
(Intercept)	4.28734609	2.460496e-22	0.957188398	2.293112e-01
SongChristianFriends	-2.00490690	2.667534e-33	-3.448106601	1.406188e-17
SongCordeNatus	-0.97470568	1.295629e-06	-2.069062067	5.970759e-06
SongDarkAwaitsDawn	-1.14683652	1.678847e-13	-2.059002517	1.625902e-07
SongGloria2023	-1.66262100	6.132635e-17	-2.697254532	1.161994e-09
SongGlorification	-0.26897451	8.200530e-02	-0.637438198	1.446970e-01
SongHallelujahNewbornKing	-0.72878983	3.144059e-04	-2.012142724	1.258724e-05
SongHodieChristus23	-1.41776917	6.617567e-12	-2.429391583	1.155882e-07
SongInBleakMidwinter	-1.23518901	2.403690e-15	-2.302575342	3.921398e-09
SongJauchzetFrohlocket	-1.60866771	4.357366e-25	-2.530476300	7.426964e-11
SongJoytoWorld	-1.27735375	6.394839e-15	-2.246506330	1.919964e-08
SongLoveHasCome	-1.85440855	2.490214e-28	-3.193117481	2.132514e-15
SongLoveJoyComeYou	-1.33735802	5.853648e-18	-2.408300732	6.026206e-10
SongOgoNiFumOluwa	-1.65417850	1.515742e-17	-2.696442405	1.586174e-09
SongOHolyNight	-0.49333079	1.373998e-03	-1.073317712	9.851381e-03
SongOMagnumMysterium	-1.31863083	4.211079e-11	-2.467785874	4.133413e-08
SongRejoiceBelievers	-1.95125433	1.155146e-32	-3.292460238	1.512318e-16
SongSummerInWinter	-1.43646238	8.390908e-13	-2.428695387	5.279252e-08
SongWelcomeWonders	-1.52153432	8.250548e-23	-2.535069761	6.449239e-11
SongWinter_Night	-0.84194217	4.934055e-05	-1.502828588	1.971141e-03
Choir23Cantorei	-0.05072881	8.706211e-01	0.342868064	5.106208e-01
Choir23Chapel Choir	-0.15415011	6.184759e-01	0.005392301	9.916842e-01
Choir23Manitou Singers	0.29022380	3.451991e-01	0.762739028	1.387923e-01
Choir23Other (Audience member)	-1.20128097	2.935189e-02	-1.481255226	1.194432e-01
Choir23St. Olaf Choir	-0.07295063	8.179710e-01	0.146775081	7.825803e-01
Choir23St. Olaf Orchestra	-0.94009693	3.942607e-02	-0.645313751	4.175391e-01
Choir23Viking Chorus	0.37816981	2.417130e-01	0.757146973	1.630723e-01
SoloChoirTRUE	0.97327711	9.349146e-15	1.443785245	4.587770e-09
Voice23Alto 1	0.73895522	1.457636e-02	1.397979396	7.954036e-03
Voice23Alto 2	0.88567678	3.343666e-03	1.636495327	1.874851e-03
Voice23Bass 1	0.88888116	2.742140e-03	1.547450983	2.792330e-03
Voice23Bass 2	0.55751331	6.888729e-02	0.615757333	2.463773e-01
Voice23N/A	1.90068058	1.751681e-06	2.533314393	5.072810e-04
Voice23Soprano 1	0.51033915	9.269309e-02	0.932178273	7.725016e-02
Voice23Soprano 2	0.94419314	1.802809e-03	1.762991292	8.503394e-04
Voice23Tenor 1	0.52139555	9.257602e-02	1.255457545	1.991353e-02
Voice23Tenor 2	0.68416590	2.344499e-02	1.310213900	1.303303e-02

1–37 of 37 rows

Figure 9: 2023 Models

Song	n()	SongMean	SongCentMean	sd	Year
BeautSav2021	45	5.177778	1.2518717	1.072145	21
ChristusNatusEst	42	5.023809	1.1217144	1.387894	21
Nimrod	45	4.933333	1.0074272	1.321157	21
SilentNight	42	4.904762	0.9645715	1.100100	21
NuncDimittis	43	4.837209	0.9328373	1.213618	21
PraiseLord	42	4.547619	0.6455239	1.382863	21
Gloria2021	41	4.487805	0.5680435	1.286895	21
InSilentNight	44	4.318182	0.3939597	1.253325	21
MaryBoyChile	42	4.214286	0.3121906	1.259805	21
Rachmoninov	43	4.209302	0.3049303	1.712116	21
AngelsDance	43	4.186046	0.2625531	1.562291	21
DeepUnboundedDarkness	42	4.000000	0.0979049	1.168697	21
CarolForChoirs	42	3.952381	0.0502858	1.208756	21
LightDawns	43	3.906977	0.0026047	1.673519	21
Past3Clock	45	3.688889	-0.2370172	1.635157	21
MountofOlives	44	3.659091	-0.2474545	1.493290	21
LlegaNavidad	43	3.674419	-0.2490748	1.491578	21
HolyChild	42	3.547619	-0.3740528	1.310416	21
LoHowARose	41	3.512195	-0.3935719	1.380615	21
LoveDivine	43	3.511628	-0.4108320	1.222256	21
CarolAdvent	41	3.439024	-0.4777173	1.225740	21
GodRestMerryGentlemen	41	3.439024	-0.4807370	1.025885	21
TellOnMountain	42	3.333333	-0.6134925	1.572115	21
AngelHeardHigh	44	3.295454	-0.6287676	1.111871	21
LoveCameDown	42	3.238095	-0.6835766	1.321668	21
GodsLoveMadeVisible	42	2.857143	-1.0449523	1.406803	21
GodisLove	42	2.714286	-1.1878094	1.235367	21
GoodChristianFriendsRejoice	43	2.651163	-1.2532092	1.152300	21

Figure 10: 2021 Songs Summary

Song	n()	SongMean	SongCentMean	sd	Year
OvertureNutcracker	66	5.409091	1.4305965	0.9110817	22
BeautSav2022	72	5.208333	1.2731306	1.0606602	22
CarolofStranger	69	5.043478	1.0971677	1.2058044	22
WillMakeWay	64	4.656250	0.7134862	1.4607972	22
Psalm50	70	4.585714	0.6423961	1.4294304	22
DonaNobisPacem	70	4.571429	0.6281104	1.3250259	22
CarolBells	66	4.378788	0.4467475	1.3896890	22
StayWithUs	69	4.347826	0.3875404	1.2698551	22
KeepYourLamps	64	4.218750	0.2759862	1.3028510	22
LittleLightMine	68	4.044118	0.1203384	1.2979182	22
EarthStrikeMusic	64	4.062500	0.1082200	1.4679107	22
OrchNoel	67	4.044776	0.0665098	1.0362057	22
AwakeHarp	70	3.971429	0.0281104	1.3293938	22
SongofPeace	62	3.887097	-0.0561161	1.2817104	22
HeartWorships	68	3.750000	-0.2121343	1.1509244	22
HarkHeraldAngels	72	3.458333	-0.4865593	1.1620465	22
HodieChristus22	68	3.352941	-0.5920868	1.2785802	22
MidnightClear	70	3.314286	-0.6389143	1.1861869	22
AwakeGreetMorn	70	3.057143	-0.8861753	1.3064579	22
DayPeace12	65	2.969231	-0.9966496	1.1854486	22
SirChristemas	71	2.732394	-1.2117221	1.6557928	22

Figure 11: 2022 Songs Summary

Song	n()	SongMean	SongCentMean	sd	Year
BeautSav2023	137	5.131387	1.0811487	1.076606	23
Glorification	140	4.842857	0.7965544	1.195143	23
HallelujahNewbornKing	61	4.622951	0.5951201	1.550956	23
OHolyNight	142	4.633803	0.5808301	1.268712	23
CordeNatus	62	4.370968	0.3507544	1.204280	23
Winter_Night	55	4.400000	0.3414117	1.226256	23
OMagnumMysterium	65	4.153846	0.0960293	1.337334	23
HodieChristus23	61	4.032787	0.0039013	1.413827	23
DarkAwaitsDawn	140	3.978571	-0.0671361	1.322021	23
OgoNiFumOluwa	80	4.037500	-0.0921321	1.487873	23
SummerInWinter	63	3.904762	-0.1453420	1.240633	23
InBleakMidwinter	139	3.892086	-0.1630014	1.376251	23
JoytoWorld	115	3.852174	-0.1649023	1.208475	23
Gloria2023	69	3.753623	-0.2459981	1.264979	23
LoveJoyComeYou	144	3.777778	-0.2847861	1.319273	23
WelcomeWonders	146	3.595890	-0.4675287	1.663311	23
JauchzetFrohlocket	144	3.506944	-0.5495564	1.509858	23
LoveHasCome	108	3.287037	-0.7642698	1.200085	23
RejoiceBelievers	119	3.184874	-0.8379677	1.214087	23
ChristianFriends	112	3.125000	-0.9052286	1.369717	23

Figure 12: 2023 Songs Summary

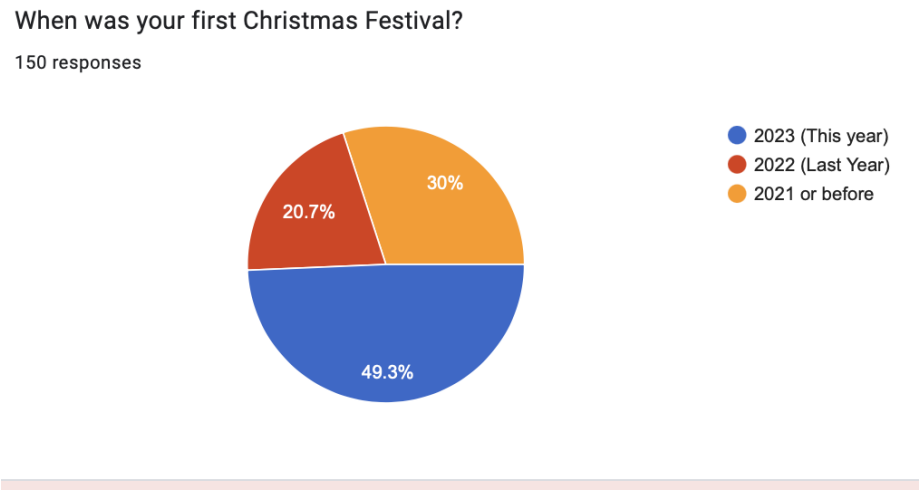

Figure 13: Summary of First Fest Year

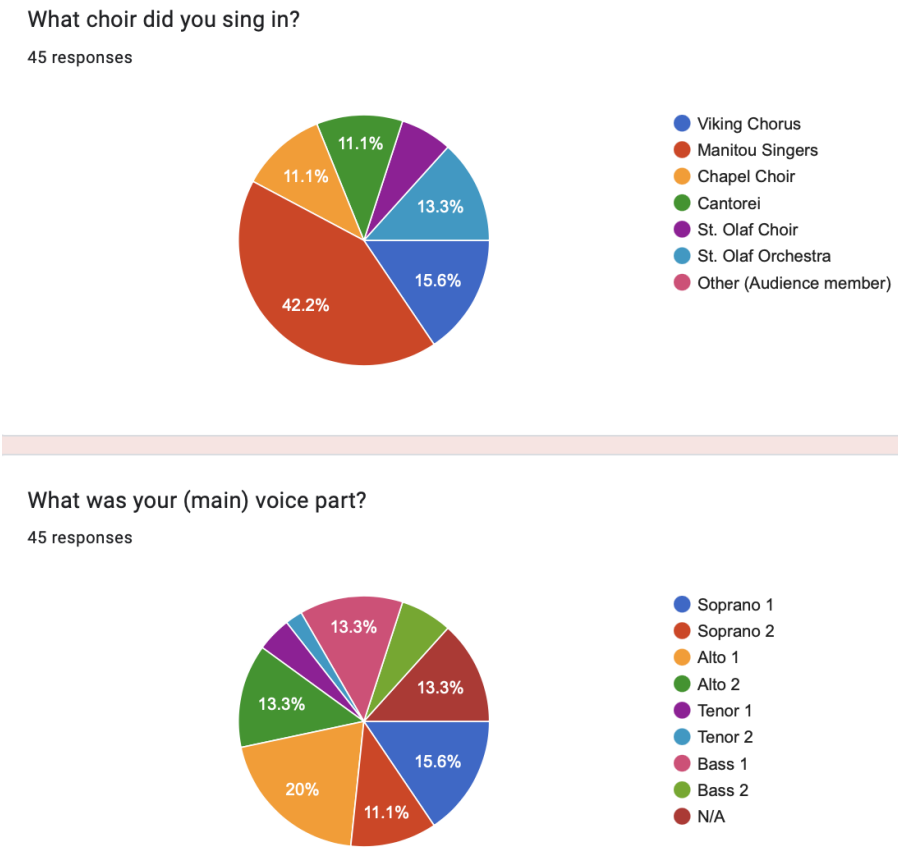

Figure 14: Demographics- 2021

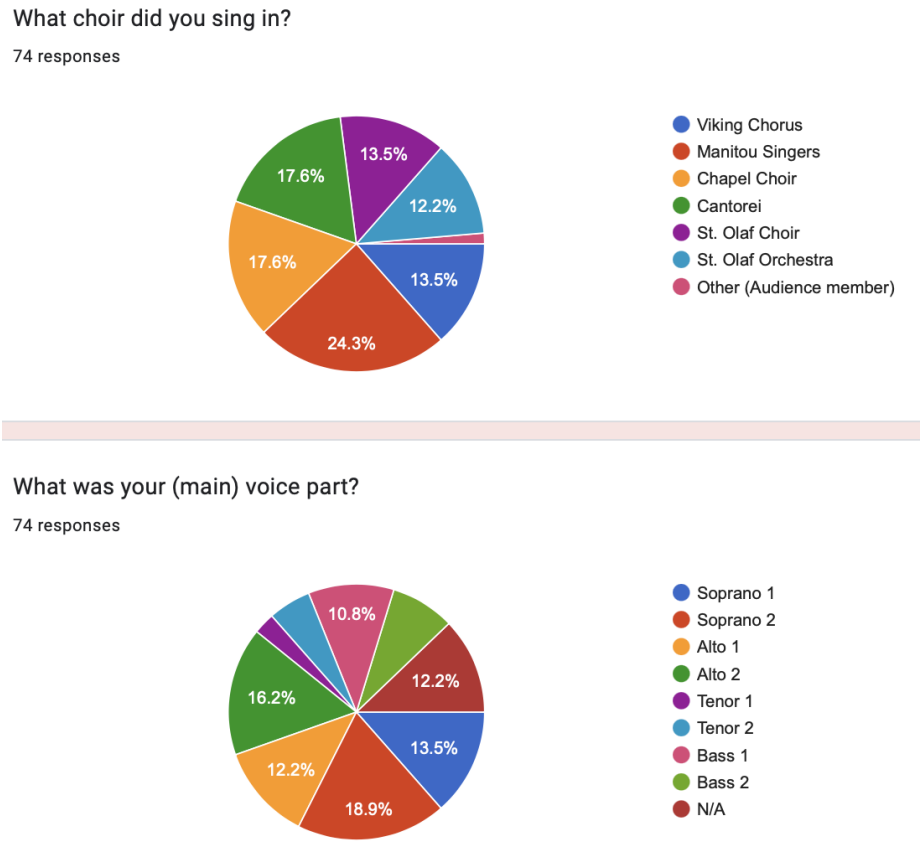

Figure 15: Demographics- 2022

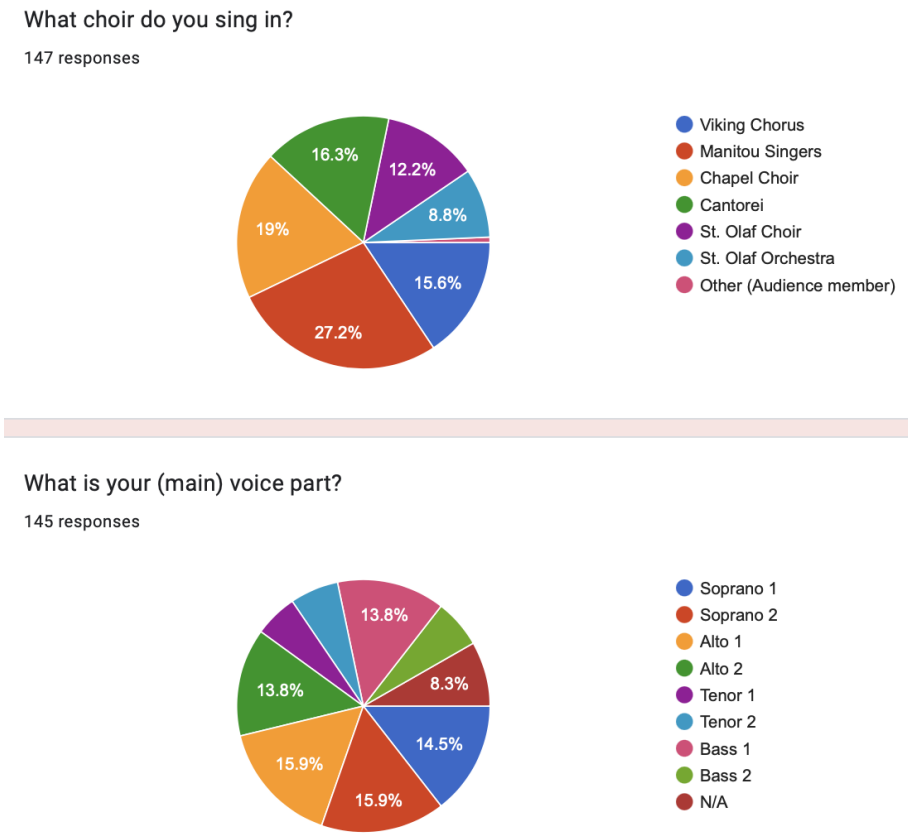

Figure 16: Demographics- 2023