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New, Not Different: Data-Driven Perspectives on Science Festival Audiences

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Abstract

This commentary explores the kinds of audiences who attend science festivals in the United States by examining data from nearly 10,000 attendees from 24 festivals. Findings are presented to describe festival audiences overall and in comparison to national census and polling data. Results are similar to those for other public science events, with the majority of attendees being well-educated and middle-class. Even so, approximately two thirds of festival-goers are new each year. The findings are discussed in relation to evidence that begins to establish a typology of public science event attendees, and the need to reach "new" versus "different" audiences.

Keywords

science festival, science communication, public engagement, public science events

Introduction

In recent years, there has been significant growth in science festivals in the United States. In the mid-2000s, a handful of American science festivals were in existence; today 56 festivals are members of the Science Festival

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Alliance, a U.S.-based organization dedicated to "fostering mutually beneficial relationships and exchanges among festival professionals" (https://sciencefestivals.org/about/membership/), and additional festivals are launched each year. While each festival is a unique reflection of its home community, science festivals share some common characteristics (Bultitude, McDonald, & Custead, 2011): (a) They celebrate science, technology, engineering, and related areas; (b) they engage the public with scientific content; (c) they are time-limited events that recur annually or biennially; and (d) they use a common theme or branding to unify their various activities. Beyond these characteristics, the particulars can differ significantly, with budgets varying by a factor of 1,000, geographic goals ranging from a neighborhood to a city to a state, length varying from 1 day to 1 month, and staffing ranging from entirely volunteer to several full-time paid staff (Wiehe, 2014). Most science festivals include at least one large, free public exposition event (hereafter referred to as Expos) with hands-on activities and demonstrations led by local science, technology, engineering, and mathematics professionals and educators. The size of an Expo is generally a reflection of the locale's population and can range from an event with a small number of exhibitors that draws several hundred attendees to more than 100 exhibitors and thousands of attendees.

Evaluation of Festivals

Two recent publications have begun to describe the characteristics of those who do (and do not) attend science festivals. An analysis of three events in the United Kingdom found that festivals reached audiences who were economically privileged and better educated than national census rates, and that festival-goers valued science highly prior to attending the event (Kennedy, Jensen, & Verbeke, 2018). Similar trends were found in the only known study to focus on U.S. festival audiences. Rose, Korzekwa, Brossard, Scheufele, and Heisler (2017) found that festival-goers at the Wisconsin Science Festival were more likely to hold a college degree, and they had greater trust in university scientists when compared to citizens who participated in a statewide survey.

Similar results are found across a range of public engagement strategies. For example, a study of the California Science Center, a free museum in Los Angeles, found that individuals with more education as well as higher income were more likely to have visited (Falk & Needham, 2010). This finding mirrors stable historical trends for attendance at informal science institutions across the U.S. (https://www.nsf.gov/statistics/2018/nsb20181/report/sections/science-and-technology-public-attitudes-and-understanding/interest

-information-sources-and-involvement). In the context of citizen science, volunteers in Australia were found to be more educated and have higher engagement with science when compared to groups who were less involved (Martin, 2017). Similarly, Japanese attendees at local research institution open houses were distinct from the general public in that they attended more scientific/technology and arts/literacy programming overall (Kato-Nitta, Maeda, Iwahashi, & Tachikawa, 2018).

This commentary documents characteristics of festival attendees from across the United States by leveraging data collected through the *EvalFest* project. *EvalFest* consists of a community of practice of 25 festivals who have united around the goal of exploring science festivals through the use of shared measures. Shared measures have been defined as instruments that were developed through an examination of the reliability and validity of the measures' items to provide evidence to support their intended use across programs that are addressing the same construct or outcome (Grack Nelson, Goeke, Auster, Peterman, & Lussenhop, in press). One such shared measure is an intercept survey that was developed and tested as part of *EvalFest* for use during Expos, which are common across all partners, and thus a primary context for evaluation. Data collected from Expo attendees deepen our understanding of who attends science festivals in the United States and of the ways that these audiences are similar to and different from the general population, as well as the subset of the general population that visits science centers.

Measures

Three data sources were used to conduct the analysis. Results from the U.S. Census are described first; the census categories were used to code the data from each of the two remaining sources, the *EvalFest* Intercept Survey and the General Social Survey (GSS).

U.S. Census Data

Demographic data from the 2016 U.S. Census were used to compare the characteristics of festival attendees to the general public (https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml). Four variables were of interest. The census defines gender in two categories (*male, female*). Race/ethnicity is reported via eight categories: *American Indian/Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian/Pacific Islander, White*, and *some other race*. Those who chose one race/ethnicity option only are assigned to the category selected. People who select any other

combination of two or more race/ethnicity options are assigned to a *Two or More Races* category, with one exception: Those who chose *White* and *Hispanic* are assigned to *Hispanic*. The portion of citizens assigned to each category (including *other*) is calculated and reported.

Education level is reported for those 25 years of age and older using six categories: *less than high school, high school or GED, associates/2-year, college/4-year, master's*, and *PhD/professional*. The latter two categories were combined for this analysis into *graduate* to match the coding of the GSS. Median household income is reported using ten categories: *less than $10,000, $10,000 to $14,999, $15,000 to $24,999, $25,000 to 34,999, $35,000 to 49,999, $50,000 to 74,999, $75,000 to 99,999, $100,000 to 149,999, $150,000 to 199,999*, and *$200,000 or more*. For analysis purposes, several categories were condensed: The first two categories were combined into *less than $15,000*, and the upper categories were condensed to *$75,000 to 149,999* and *over $150,000*.

EvalFest *Intercept Survey*

The 9,759 surveys analyzed for this study were collected during 2017 by 24 *EvalFest* partners. Each *EvalFest* partner was responsible for collecting data during their Expo. To collect the data, field researchers were assigned to specific zones at the venue, and asked to pick a spot to begin the intercept process. The fifth person to cross the researcher's path was then invited to complete the survey.

Four demographic items and one participation item were of interest (see the appendix). Responses to the gender question were coded to align with the two census categories. Race/ethnicity data were collected via a check-all-that-apply item that was coded to match the eight census categories.

Survey respondents did not provide income data; instead, home *zip code* was collected and matched to median household income data from the U.S. Census (https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_DP03&src=pt).

Not all *EvalFest* partners included a question about education level: 2,377 surveys included a single item asking about education level. As with the census data, *master's* and *PhD/professional* were condensed into a single census category called *graduate*.

Finally, a subset of *EvalFest* partners included a participation item asking whether attendees had been to previous festivals. The 4,243 survey responses were coded as *yes*/*no*, and used to document the portion of returning versus new attendees.

Table 1. *EvalFest* Demographics, Comparisons by Gender.

Gender	2017 *EvalFest* (%)	2016 Census (%)	2016 Visited Science center (%)
Female	61	50.8	57
Male	39	49.2	43

The General Social Survey

Since 1972, the GSS has collected data on demographic, behavioral, attitudinal, and special interest topics (http://gss.norc.org). The 2016 GSS data set was downloaded to track whether and how often people visit science centers. Respondents were asked how many times they visited a science or technology museum during the last year. Responses to this item and corresponding demographic data were available from 1,389 people. The demographic items of interest were: gender, race/ethnicity, education level, and income level (see http://gss.norc.org/get-documentation for items).

Data were recoded, as necessary, to match the coding categories described above. The variable SEX was used to report gender as *male* or *female*. The GSS variables RACECEN1, RACECEN2, RACECEN3, and HISPANIC were used to assign participants to one race/ethnicity category based on the criteria described above. In addition, the 27 income categories for the GSS variable INCOME16 were collapsed into the 7 categories described above. To create comparable data for education level, the AGE variable was used to isolate participants over the age of 25. Those who met this cutoff were then included in the analysis of the variable DEGREE.

Results

The demographic comparisons of *EvalFest*, census, and polling data indicate that festival Expo attendees are similar to those who visit science centers and different from the U.S. population in a number of ways. Women, for example, are overrepresented among both festival attendees and science center visitors (see Table 1).

Differences were also found for race/ethnicity (see Table 2). Mixed results were found among groups that are underrepresented in science in the United States: Though the portion of festival-goers and science center visitors who identified themselves as Black were similar to census rates, Hispanic/Latino Americans were underrepresented among both festival-goers and science center visitors. Asians were overrepresented among Expo attendees, though they attend science centers at similar rates to those found in the population.

Table 2. *EvalFest* Demographics, Comparisons by Race/Ethnicity.

Race/ethnicity	2017 *EvalFest* (%)	2016 Census (%)	2016 Visited science center (%)
American Indian	1	<1	1
Asian	12	5	4
Black	12	12	13
Hispanic/Latino	11	17	9
Pacific Islander	1	<1	—
White	57	62	73

Table 3. *EvalFest* Demographics, Comparisons by Educational Level.

Educational level	2017 *EvalFest* (%)	2016 Census (%)	2016 Visited science center (%)
Graduate degree	31	12	18
Bachelor/4-year college	43	33	33
Associate/2-year college	16	43	12[1]
High school	10	10	38

The results for education and income level were similar to those reported in the United Kingdom (Kennedy et al., 2018). *EvalFest* attendees were highly educated, with the majority holding a college or graduate degree; these rates were elevated compared to both census and polling data (see Table 3).

According to the Pew Research Center, middle class is defined as "earning two-thirds to twice the national median household income," which translates to a median 2016 household income between $39,000 and $118,000 (https://www.businessinsider.com/middle-class-income-us-city-san-francisco-2018-2). The majority of *EvalFest* attendees fall within this range (see Table 4). Over half of all festival-goers reported residing in an area where the median income ranged between $35,000 and $74,999; this portion was much higher than that for either the census or polling data. *EvalFest* Expo attendees were underrepresented at both the highest and lowest ends of the income scale, compared to both the census and science center data.

The results thus far indicate that Expo attendees are lacking in diversity and might be categorized as the "usual suspects" for public science events. The final question of interest indicates that while festivals are not reaching different audiences, they are reaching new audiences each year. In 2017, approximately two thirds of Expo attendees (64%) reported that they were

Table 4. *EvalFest* Demographics, Comparisons by Income.

Income, $	2017 *EvalFest* (%)	2016 Census (%)	2016 Visited science center (%)
≥150,000	3	23	14
75,000-149,999	35	23	25
50,000-74,999	36	17	19
35,000-49,999	18	12	10
25,000-34,999	8	14	10
15,000-24,999	3	6	10
<15,000	—	6	12

attending for the first time. This result is consistent across the three years of data collected to date, and thus a stable trend. These results also seem to indicate that for the publics who do attend festivals, interest remains steady.

Discussion

The results from this study demonstrate that those who attend science festival Expos in the United States adhere to a demographic typology that is similar to that of other public science events. Even so, the majority of festival-goers are new each year, indicating that the reach of festivals continues to grow.

The consistent pattern of these results seems worthy of conversation, debate, and in some cases, action. Both Kennedy et al. (2018) and Martin (2017) note that additional research is needed to identify strategies that expand the types of audiences who attend public science events. Martin suggests further that reaching new audiences may not be of interest to or appropriate for all public engagement activities. We suggest that this latter point is crucial for considering next steps for festivals. Of the 22 *EvalFest* partners with published mission statements, only 4 include a focus on reaching either new or diverse audiences. For those with a mission to reach new audiences, the fact that nearly two thirds of festival-goers are new each year is likely a cause for celebration. For those who aim to reach diverse (i.e., different) audiences, the results demonstrate that the strategies being used are not sufficient. In either case, these national results help to paint a broad picture, while local longitudinal results are likely to provide the most meaningful reflection about successes and continued challenges in reaching different audiences.

Regardless of whether festivals or other public science events intend to reach new audiences, different audiences, both, or neither, it is important to acknowledge the consistent typology of people who attend public science

events. Are we satisfied with new audiences at our events even if they lack diversity, and why or why not? Should we consider adding audience diversity to our mission statements, and if so, what are effective strategies for starting to achieve diversity-related goals?

Many in the public science events community are interested in rethinking efforts to engage different audiences and are employing various strategies to do so. Leaders in the citizen science community have proposed a general framework for engaging diverse audiences (Pandya, 2012) and have recommended including more events that seek to reach people "where they are" (Bonney, Phillips, Ballard, & Enck, 2016). Similarly, the Science Festival Alliance is funding projects where science experiences are integrated into existing activity hubs, envisioned broadly, such as laundromats, art galleries, beach boardwalks, and football games. A long-standing model of this strategy is the Science Learning Tent at the Arlee Celebration, an annual powwow led by the Confederated Salish and Kootenai Tribes. Organized by the spectrUM Discovery Area, a hands-on science center for the University of Montana, in collaboration with SciNation (its community advisory group on the Flathead Reservation), the Science Learning Tent provides hands-on experiences that reflect the tribes' workforce priorities and the opportunity to connect with role models from the community. Other science festivals are experimenting with different strategies and finding some successes, such as greater outreach to schools and community groups, providing free buses to targeted neighborhoods, translating materials into languages other than English, advertising in media that serve immigrant and non–English-speaking groups, and increasing the diversity of exhibitors at the Expo. Our understanding of the impact of these various strategies to date is limited.

Limitations

There are a number of limitations that must be considered for these results. Scholars continue to debate how best to conceptualize and measure social class. The data sets in our analysis conform to current practices used by stratification experts, who tend to measure class using discrete categories that presumably correspond to varying levels of material assets (Grusky & Ku, 2008; see also Wright, 1996). Even so, the cutoff points for determining different class strata are somewhat arbitrary and differ from study to study.

In addition, respondents did not self-report their income; instead attendees' zip codes were matched with median household income data from the U.S. Census. As a result, the income estimates are only approximations and may under- or overestimate individual incomes. Incomes are highly variable by field, and research suggests that the impacts of race and ethnicity, gender,

and age/experience on income remain after controlling for the effects of education (see Semega, Fontenot, & Kollar, 2017, for a general discussion of income by race and sex).

Finally, the data presented here were collected at Expo events only. As a result, the findings represent a subset of festival programming rather than the entirety of experiences offered by *EvalFest* partners.

Conclusions

The growth of science festivals in the United States and consistent attendance patterns suggest that science festivals are important cultural events. Yet Expo attendees are not representative of the nation's diversity; instead, they adhere to a growing typology of publics who attend science centers and events. Distinguishing between new and different audiences, and a review of the mission statements for these events, provides critical details and supports the continued study of audiences, particularly for those who deploy strategies to increase diversity at science festivals and other public science events.

Appendix

EvalFest Survey Items

Gender: _____

What is the highest degree you have earned?

❒ Less than high school
❒ High school
❒ Associates/2-year
❒ College/4-year
❒ Master's
❒ PhD/professional

With which of these groups do you identify? Select all that apply.

❒ American Indian or Alaska Native
❒ Asian
❒ Black or African American
❒ Hispanic or Latino/a
❒ Native Hawaiian or Other Pacific Islander
❒ White or Caucasian
❒ Prefer not to answer
❒ Other; please describe:

What is your ZIP code? _____

Have you attended this festival in the past?

❒ Yes ❒ No

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Note

1. Includes 2-year degree holders and respondents who reported "some college."

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