

MapGIS - Measuring Art Participation with GIS

Jennifer J. Helzer
Professor and Director of Geography
California State University, Stanislaus

This project was supported in part or in whole by an award from the Research: Art Works program at the National Endowment for the Arts: Grant# 13-3800-7008.

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Research Report – NEA Artworks Grant 13-3800-7008

The research report will follow the outline detailed below:

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Executive Summary

This research project examined publically available data, data provided by community partners, as well as qualitative data to explore arts participation in the San Joaquin Valley of California. We utilized a geographic information system (GIS) to aid in the collection, maintenance, storage, analysis, output and distribution of spatial data and information. The overarching goal of the MapGIS project was to assess the various types of data that can be marshalled to measure the impact of the arts and more over how best to study the impact of the arts for region's similar to ours.

The first stage of this activity involved assessing the viability of publicly available data sources including the U.S. Census, the American Community Survey (ACS), Public Use Microdata Sample (PUMS), General Social Survey (GSS) and the Cultural Data Project (CDP). Each of these data sets offers data at varying scales and detail, and each presented their own special challenges in regard to usability for the communities under investigation. As the arts community considers the use of GIS and similar spatial technologies to study the impact of the arts, we offer the following preliminary suggestions about the collection and use of spatial data:

- The MapGIS project team analyzed data from the CDP and the GSS, but found little information from the survey could be utilized in a spatial database for the current project. For our purposes, the structure and the scale of the data could be useful for comparative purposes at the state or large metropolitan level.
- The ACS pretabulated (or summary) data are predefined tabulations of characteristics created by the Census Bureau in response to data user needs. There are several concerns to keep in mind when using the ACS. The first big issue is a tradeoff between geographical and temporal resolution. The 1-year files only report data for units with at least 65,000 people, the 3-year aggregations report data for units with at least 20,000,

and the 5-year aggregations report data for all units. By contrast, 3- and 5-years estimates are more precise (less current) and better for analyzing small populations.

- Unlike the tabulated data associated with ACS, PUMS data allows the user to determine the structure of the tabulation and the characteristic(s) to be tabulated. In microdata files, the unit of analysis is the individual housing unit or person, and the records include actual questionnaire responses. When working with microdata files, the data user specifies the tables to be produced and the geographic areas that are needed. The main reason to use PUMS is to create custom tabulations that you cannot find in the summary files. In exchange for the rich data available in the PUMS, the Census Bureau limits the geographic detail that is available. Data users can produce customized estimates for small population groups, but not for small geographic areas.

Three art agencies in Stanislaus County provided the geospatial data used in this project including the Modesto Art Museum (MAM), the Carnegie Arts Center (CAC), California State University Stanislaus School of Arts (SOA):

- The collection of zip-code data by two art agencies (as opposed to street address) negates the use of neighborhood level GIS datasets that could potentially provide a much more detailed profile of art patrons and thus a better measure of the impact of arts programming.
- Of the three datasets provided by project partners, the SOA credit card address data is the most useful for spatial analysis. The SOA patron address data scales with neighborhood level GIS datasets.
- Additional strengths of the SOA datasets included the ability to use the Lookup Table for event ticket prices making it possible to distinguish between student and public ticket sales, as well the type of event (art, music, theater). Additionally, the online service that is used to purchase tickets for SOA events is modifiable and therefore the SOA may want to consider using this option to gain additional information about the impact their programs and activities are having in the region.
- Our collection and analysis of project partner data revealed several interesting results. First and not surprisingly, data collection by art providers is primarily focused on events. Providers are most interested in gathering information that can help them to plan similar events in the future and to learn if their promotional efforts worked.
- While census zip code data would seem a perfect match to the data collected by MAM and CAC, knowing an art patron's zip code actually reveals little about that art patron in a more rural region like Stanislaus County. A more useful scale of analysis for the purposes of revealing spatial patterns would be that of the census tract or even the

census block level that results in far greater spatial differentiation, but requires more detailed patron information at the neighborhood (individual address) level.

- The partner data utilized for this project was largely aggregated by zip code and therefore can only be combined with data at the same level of precision. The zip code data cannot be combined with data sets that have higher precision (census tract, etc.) without introducing bias and error into our maps. In short, finer scale data like addresses and census block data can be aggregated, while coarser scale data (country level, zip code) cannot be easily divided.

The research design included a second level of qualitative data gathering and analysis in order to explore the underrepresentation of minority groups in art making and art participation. Our qualitative data gathering canvassed two broad categories of art providers including, *institutional* providers which was primarily made of schools with some form of art programming; and *non-institutional* providers which included any organization, club or community center with art programming.

- The response we received from institutional providers was wide-ranging in terms of the structure and staffing of programs, and program resources.
- The non-institutional providers shared several common features. First, the majority of groups we surveyed were strongly tied to organizations representing the region's diverse cultural-heritage groups, including South Asian Indians, Southeast Asians (Cambodian and Hmong) and Mexico. The organizations also had a similar focus and shared purpose. An often-stated goal for many groups was that of cultural maintenance while sharing knowledge of the group with the larger host society.

Throughout the project, the research team noted many ways to improve data collection and discussed opportunities to make the visualization results more useful to the arts community:

- Art providers, organizations, and institutions can develop shared knowledge from analyzing data in cartographic form and then use this knowledge as the basis for developing a coordinated, strategic agenda with clear objectives and a plan of action. In order to reach this goal, data collection processes often need to be improved and upgrades made to parallel current and future technical capacities.
- In the current project, partner data was not collected with an eye towards its use in a spatial database and the consistency of data gathering was unclear. Program leaders, staff, artists and researchers would benefit by having a conversation about data that will support decision-making in new and innovative ways.

Specific recommendations:

- Invest in GIS university-community partnerships similar to those utilized for the current project.

- Develop a voluntary geographic information (VGI) initiative. One of the vexing problems in social science research is how to combine quantitative and qualitative data together for effective analysis and decision-making. One promising avenue combines new interactive web-based technologies and user-generated content. Volunteered Geographic Information or VGI represents a new change in how information is created and shared.
- Develop a regional/local GIS art center initiative whose mission is the production of spatial narratives based on public data, data collected from regional art organizations and institutions, and geographic information from volunteers (VGI).

Importance – A review of the research questions and why they are important.

The MapGIS project is an exploratory endeavor to measure art participation using geographical information technology or GIS. A GIS is a computer-based system used to aid in the collection, maintenance, storage, analysis, output and distribution of spatial data and information. A GIS can pull disparate information together that help solve vexing questions and support decision making. The technology has long been applied to manage environmental resources, to deliver effective government services and to support urban planning and economic development. The use of geospatial technology by community-based organizations, particularly those in the arts, is by contrast little studied. The project set out to answer two related questions. First, do available measures adequately capture the impact of arts participation and art-making in the central San Joaquin Valley of California, specifically Stanislaus and surrounding counties? Secondly, what accounts for the differential impact across our region? We suspect that the impact of the arts will not be uniform across our region and we are interested in exploring why this is the case and whether available data adequately explain the differences. For example, why does the effect of the arts appear strong in some areas and weak in others? Relatedly, is arts participation high for some groups and limited for others? A major goal of the project is to learn how best to study the impact of arts participation and art-making for our region and for those areas with a comparable geography, a similar demographic make-up, and with corresponding socioeconomic characteristics. The region's economic base is tied to agriculture and its cities are modestly sized, with Modesto, the largest city in Stanislaus County at just over 200,000 people. We hypothesize that the impact of the arts may be underreported for some groups and in some areas due to the inherent underrepresentation of minorities and other groups in datasets used to measure participation.

The MapGIS project is unique because it aims to combine, explore and visualize datasets using Geographic Information System (GIS). This study employs a mix of methods, including spatial analysis and qualitative approaches like participant observation and survey questionnaires in order to identify useful data, as well as potential data problems, that will serve to inform best practices to measure the impact of the arts in regions similar to our own.

The project utilized Esri's ArcGIS and other mapping and visualization software for creation, input, storage, representation, and retrieval of the spatial datasets associated with the project. Datasets such as the American Community Survey, the General Social Survey, and the Cultural Data were reviewed for their potential use in a GIS to explore the research questions above. A major focus of the project was to assess and utilize localized datasets and arts participation indicators provided by community partners which were incorporated into a GIS to assess impact. Another important aspect of the study was to learn what was important to the community of art providers. Specifically, we were interested in what information is useful to meet their needs, what information is realistic to collect in terms of time and resources, and we were curious to learn how we as researchers can further support this effort.

We increasingly live in a data-driven, evidence-based society and organizations and non-profits are faced with both the opportunity and the burden of how to cope with the increasing availability and volume of a data. While there are many data sources to choose from, not all public data is appropriate for local art providers, or the organization lacks the expertise and/or resources to collect, analyze and report on relevant data. Organizations may also be interested in collecting their own data or may have existing datasets, but lack the resources or expertise to transform and manage their data resources in order to make them meaningful to the organization. The overarching goal of the MapGIS project was to assess the various types of data that can be marshalled to measure the impact of the arts and more over how best to study the impact of the arts for region's similar to ours.

Regions such as ours that are highly culturally diverse and have many low socioeconomic factors could benefit from a model measurement tool that would allow them to understand what arts have the greatest access, who accesses the arts in their area, how, when, and other factors, particularly as they relate to specific variables of the audience such as gender, culture, geographic residence and socioeconomic stratification. This project will inform literature on best practices in utilizing GIS and other forms of geospatial technology for understanding the impact of arts on communities, and can be used by arts agencies in developing best practices in programming based on better understanding of their communities.

Review of existing literature and previous work on the topic.

As stated in the original proposal description, this review will be limited in existing literature, due to the lack of research on the subject of using GIS to explore arts participation in *rurban* communities. The cities and towns of Stanislaus County are characterized as rurban due to blend of urban and rural landscapes that result from the rapid conversion of farmland to residential and industrial uses. The population of Stanislaus County and the San Joaquin Valley region as a whole is expected to grow more rapidly than other parts of the state. The county well exceeds California's average of Hispanic/Latino residents with 43.5 percent compared to 38.5 percent for the state as a whole. Given these expected future changes and their socioeconomic impact, the review of existing literature will focus on the use of GIS for planning and implementation by community and non-profit organizations.

Scholars from a wide variety of disciplines have addressed the topic of the impact of the arts from several vantage points, with the most common being the arts potential for economic impact, economic development, and/or urban revitalization. A review of this vast literature is beyond the scope of this project; however, several studies are worth mentioning because they have led geographers and other researchers to see the potential to utilize spatial analysis, and often times employ geospatial technology, to examine research questions. In recent years, geographers along with other scholars have taken a heightened interest in arts and urban and economic development largely due to the introduction of Richard Florida's "Creative Class" into academic debate, as well as the popular lexicon (Florida 2002). The central focus of Florida's best-selling book stresses that cities and metropolitan regions with high concentrations of technology workers, artists and gay men have a higher level of economic development. His work has often been touted by urban planners and just as often it has been criticized by academics. Interestingly, those researchers who are critical of Florida's work have often focused on the author's methodology and data sets, which they have analyzed and come up with different results (Glaser 2004; Marcusen 2006). What Florida's work has done is get us focused on space and locations by exploring methods that measure the impact of phenomenon in a given area...in this case ways to measure the impact of art in semi-urban cities of the Northern San Joaquin Valley.

In addition to popular designations like the creative class, many government and non-governmental institutions use spatial data to rank places large and small. There seem to be no end to the type of reporting that stratifies the best and worst place to live, find employment, or have access to clean water and even access to the arts. For example, in the early 2000s, the Brookings Institute developed the classification of "weak markets" to describe individual cities and Metropolitan Statistical Areas (MSAs) that suffer from high rates of abandoned and vacant land and buildings, outmoded and poorly maintained infrastructure and minimal development potential. The San Joaquin Valley region that includes Stanislaus County, the focus of the current study, was one of the nation's hardest-hit areas in the recent recession and the region's economic recovery has been slow compared to other areas of the state. While no city or MSA in Stanislaus County made the "weak markets" list, the most recent Brookings report includes three cities in nearby counties and taken together they constitute half of the weak market cities in the western United States. In fact, the study suggests that the region has more in common with the rust-belt cities of urban east rather than the western sun-belt cities characterized by reinvention and revitalization.

http://www.brookings.edu/metro/speeches/20060508_WeakMarketCities.pdf .

These types of studies have the potential to undermine development activities and oftentimes become a permanent brand of the city or region. They also have the potential to embolden civic leaders, community organizations, and ordinary citizens that are broadly involved in revitalization to take action. A recent example of this phenomenon is evident in the collaborative project between the Modesto Art Museum and the University which succeeded in securing grant funding and support through an ArtPlace grant with the goal of *Building a Better Modesto*. According to the press release the *grant will fund...(the) Modesto Art Museum's response to the city's ranking as the least livable or most miserable in the country...using public*

art architecture, landscape and urban design to acknowledge the city's unique assets.
modestoartmuseum.org/images/ArtplaceRelease1.pdf

We draw attention to this unique example in the study area because the University and specifically the Geography program were involved in collecting a portion of the primary data that supported the grant application. Specifically, geography students enrolled in an upper-division Planning Issues course utilized community-based learning pedagogy to collect, analyze and visualize (using GIS mapping tools) spatial data that found evidence of the city's newly designated downtown design district. In a separate project students conducted field work to identify and update the Museum's database of public art. These two local examples provide evidence of how a growing number of community organizations are using digital spatial technologies such as GIS to carry out spatial analysis and mapping for program planning and implementation (Sieber 2000; Sawicki and Peterman 2002; Elwood and Leitner 2003). They also highlight how different types of knowledge, in this case spatial knowledge using GIS and other digital technologies, are often given greater weight in planning and policy making than knowledge presented in other ways (Aitken and Michel 1995). There are many examples of GIS initiatives that have enabled community organizations and grassroots groups to collect and disseminate their spatial knowledge. New approaches and innovations in GIS will continue to transform the range of spatial knowledge and perspectives than may be advanced to support organizational planning, problem-solving and implementation.

One of the most interesting and recent cases of spatial analysis of the arts is that of Ryberg, Salling and Soltis (2013) whose geography of artists explores methodologies for predicting artist-concentrated neighborhoods in Cuyahoga, Ohio. The study mapped and analyzed existing patterns of artists using a survey of artists, property data, and U.S. Census data. The researchers worked with artist organizations to obtain artists' information including email addresses to conduct the survey and create an artist database. Because the database included individual addresses, researchers were able to match these records with county property records in order to identify artist-concentrated neighborhoods and subsequently develop a descriptive profile of each neighborhood through visual analysis and local knowledge. Once the artist neighborhoods were defined, they could then be compared to each other. Their study also included data from the 2000 Census (demographic, housing, socioeconomic) using assemblages of block groups.

To date, there is a dearth of literature on using GIS to understand the impact of arts on specific areas; however, there is a growing body of work that examines how new web-based GIS and geospatial technologies are transforming the way we collect, share and make use of spatial data. This theme and its relevance to the current project will be explored in subsequent sections of this report.

Description of the data used in analysis.

The purpose of the project was to create a working model using GIS technology which can be used by art organizations and institutions in small rural-urban locales to determine the impacts of the arts in their community. The first stage of this activity involved assessing the viability of

publicly available data sources including the U.S. Census, the American Community Survey (ACS), Public Use Microdata Sample (PUMS), General Social Survey (GSS) and the Cultural Data Project (CDP). Each of these data sets offers data at varying scales and detail, and each presented their own special challenges in regard to usability for the communities under investigation.

The MapGIS project team analyzed data from the CDP and the GSS, but found little information from the survey could be utilized in a spatial database for the current project. For our purposes, the structure and the scale of the data could be useful for comparative purposes at the state or large metropolitan level. The project partners we worked with lack the resources to participate in the CDP, but we did discuss a similar scaled down approach to creating a CDP-type collaborative at the local and/or regional level. Data collected by the General Social Survey (GSS) was similarly found to be of limited use to the current project. The cumulative file associated with the arts includes surveys of the ability to judge art, the aim of the art and questions about spending priorities related to the arts. The survey was viewed as an important resource for developing similar survey at the local and regional level and perhaps updating the survey in the form of a web-based application. We also noted the number of missing cases in the survey to be quite high. The GSS seems best equipped to support research on attitudes towards the arts. In short, these data sources do not include enough spatial information at a scale (local or regional) that would be useful for the current project.

The type of data we reviewed included various spatial datasets available through the U.S. Census. They offer data at the from state level to block level and the data which is associated with GIS data files and can be easily displayed and manipulated in a GIS system by someone trained in the technology.

A census tract is a geographic area defined by the United States Census Bureau and commonly used by researchers and public agencies to name a few. A census tract normally covers a smaller area than a city or zip code and on average includes around 4,200 residents. Figures 1 and 2 illustrate an example of the social and economic disparities associated with Stanislaus County. The spatial patterning reveals a number of local characteristics that are also common in other parts of the San Joaquin Valley. First, the pattern reveals west-side disparity with lower levels of education corresponding to income below the poverty level. A more subtle north-south pattern is also evident with higher education attainment corresponding with lower poverty levels. A similar pattern runs up and down the San Joaquin Valley and is tied to transportation infrastructure primarily linked to the development of railroads and Highway 99. Land use patterns follow transportation linkages with industry developing to the south and west of cities and new residential development focused on the north and east sectors. The "Westside" as it is commonly referred is characterized by highly developed fertile farmlands while the eastern side of the valley is increasingly less fertile as one approaches the foothill region of the Sierra.

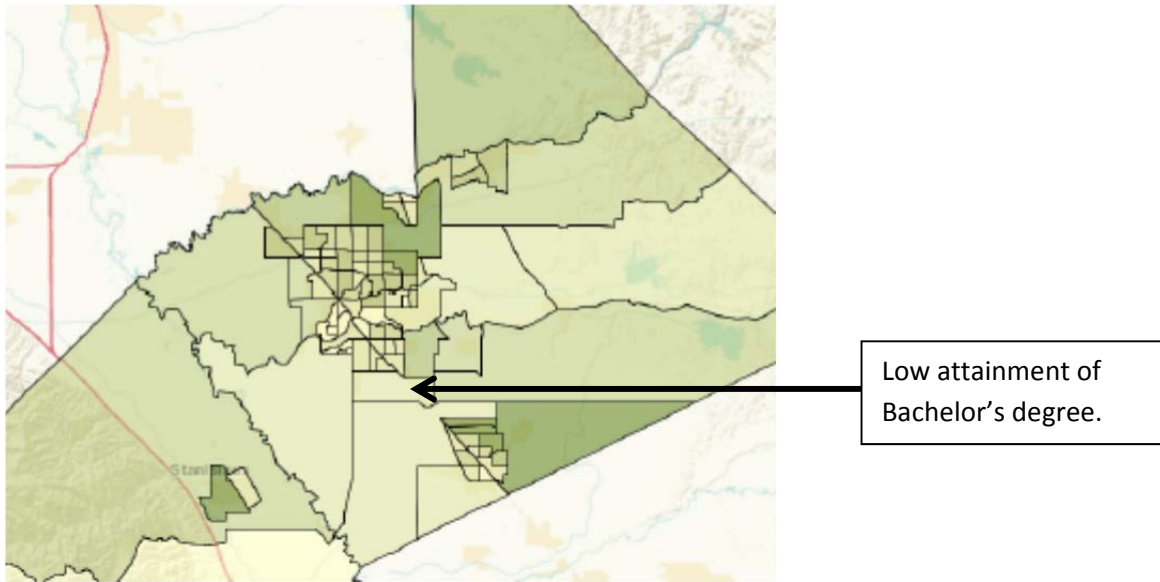


Figure 1. Educational attainment (Bachelor's degree) mapped at the census tract level.

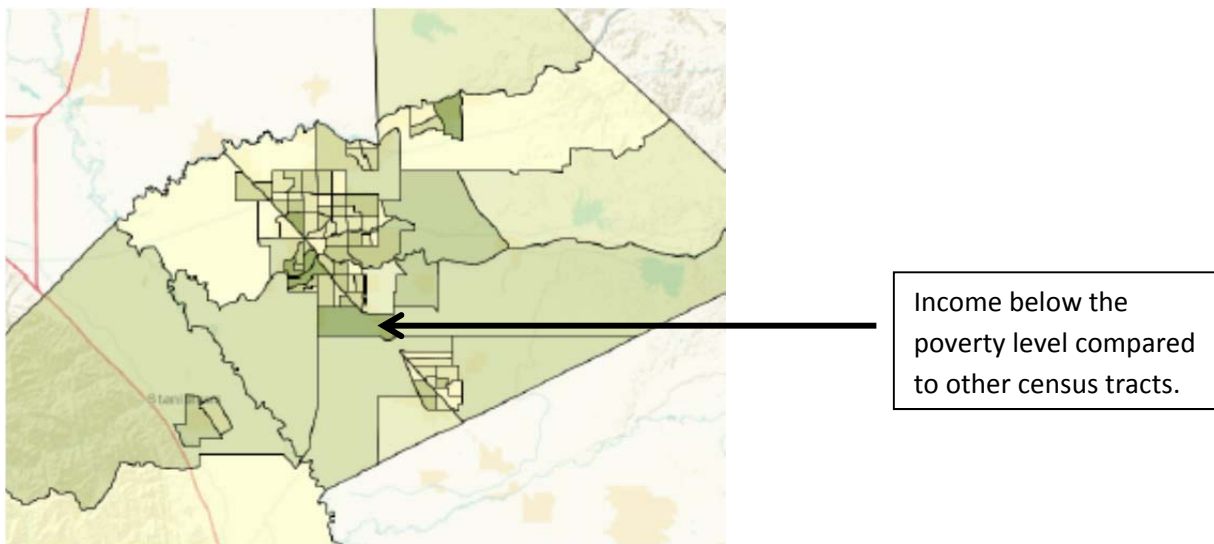


Figure 2. Income below poverty level mapped at the census tract level.

Census tracts are generally more uniformly distributed in terms of the number of residents than cities or zip codes. Also, the census tract demographic data is nearly 100% complete vs. less than 70% coverage of demographic data for cities and zip codes. Therefore, using census tracts is considered one of the best ways to compare and study smaller scale locations inside and across multiple states. For example, understanding the different areas of a large city or comparing neighborhoods in one city to neighborhoods in another city. For smaller cities like those in Stanislaus County conflating census tracts with neighborhoods and then comparing them to other neighborhoods can be problematical because census tract boundaries do not necessarily follow neighborhood delineation. Census tracts can be further divided into census

block groups and then finally census blocks for understanding locations in a block and a community level respectively.

The mismatch mentioned above highlights the important consideration of whether the scale of the data is correct for the questions being posed (e.g. county level data cannot be used to understand a local phenomenon and state level data cannot be scaled to address county characteristics). It also points to other problems that arise from aggregated data. Researchers refer to this condition as the modifiable areal unit problem (MAUP). The MAUP describes how the results of point-based measures of spatial phenomena (e.g., population density) are aggregated into districts. The resulting summary values (e.g., totals, rates, proportions) are influenced by the choice of district boundaries. For example, census data may be aggregated into census enumeration districts, or postcode areas, or any other spatial partition. Since these areal units are “modifiable” they influence the results of data analysis, maps and other visualizations (Cressie 1996). Other problems may arise due to the spatial or temporal characteristics of the datasets that may influence the analysis of the impact of the arts. The goal of this project is to test the validity of the information for rural locales like those in Stanislaus County, identify the problems in the data, and suggest solutions or alternative measures.

The project assessed data from the American Community Survey (ACS) which is an ongoing survey that provides data on a range of social and economic topics to help communities, states and the federal government determine how to allocate funding and how to plan investments and services. The ACS survey asks basic questions about the population including age, race and ancestry; detailed social questions concerning educational attainment and undergraduate field of degree; and economic questions concerning occupation, income and labor force status. The results of this detailed survey are combined into statistical measures in a predetermined tabulated format (see Figure 3).

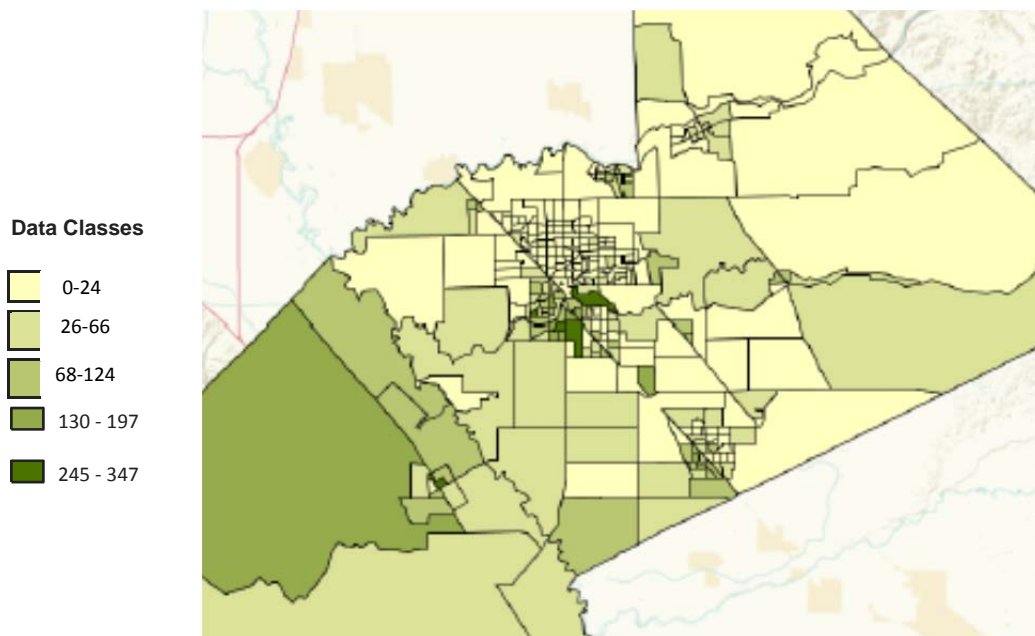


Figure 3. Hispanic or Latino males over 25 years of age with less than a 9th grade education. Census 2000 Summary File 3 (SF3) – Sample Data. Mapped at the Block Group Level.

We also evaluated the utility of Public Use Microdata Sample (PUMS) data in semi-rural regions like Stanislaus County. Unlike the tabulated data associated with ACS, PUMS data allows the user to determine the structure of the tabulation and the characteristic(s) to be tabulated.

Finally we looked at the U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) which are constructed from merging the ACS to other indicators of income and poverty. These indicators include summary data from federal income tax returns, SNAP benefits, decennial census data, postcensal population estimates, Supplemental Security Income reciprocity, and economic data from the Bureau of Economic Analysis. These estimates are then combined with direct estimates from the ACS sample to provide figures which are more precise than either set alone. Because estimates are sensitive to annual variations in economic activity and are sensitive to school district boundary changes, the U.S. Department of Education utilizes SAIPE to allocate Title 1 funds. In short, SAIPE provides the most current school-age poverty estimates available for all school districts and counties in the U.S. irrespective of population size. As evident from Figure 4, student poverty above 35 percent is highly concentrated in the San Joaquin Valley. Two other pockets include the Inland Empire near San Bernardino and the sparsely populated northwest region. Within Stanislaus County, poverty above 25 percent characterizes most of the area with the lower rates associated ranchlands and communities of the Sierra Nevada foothills.

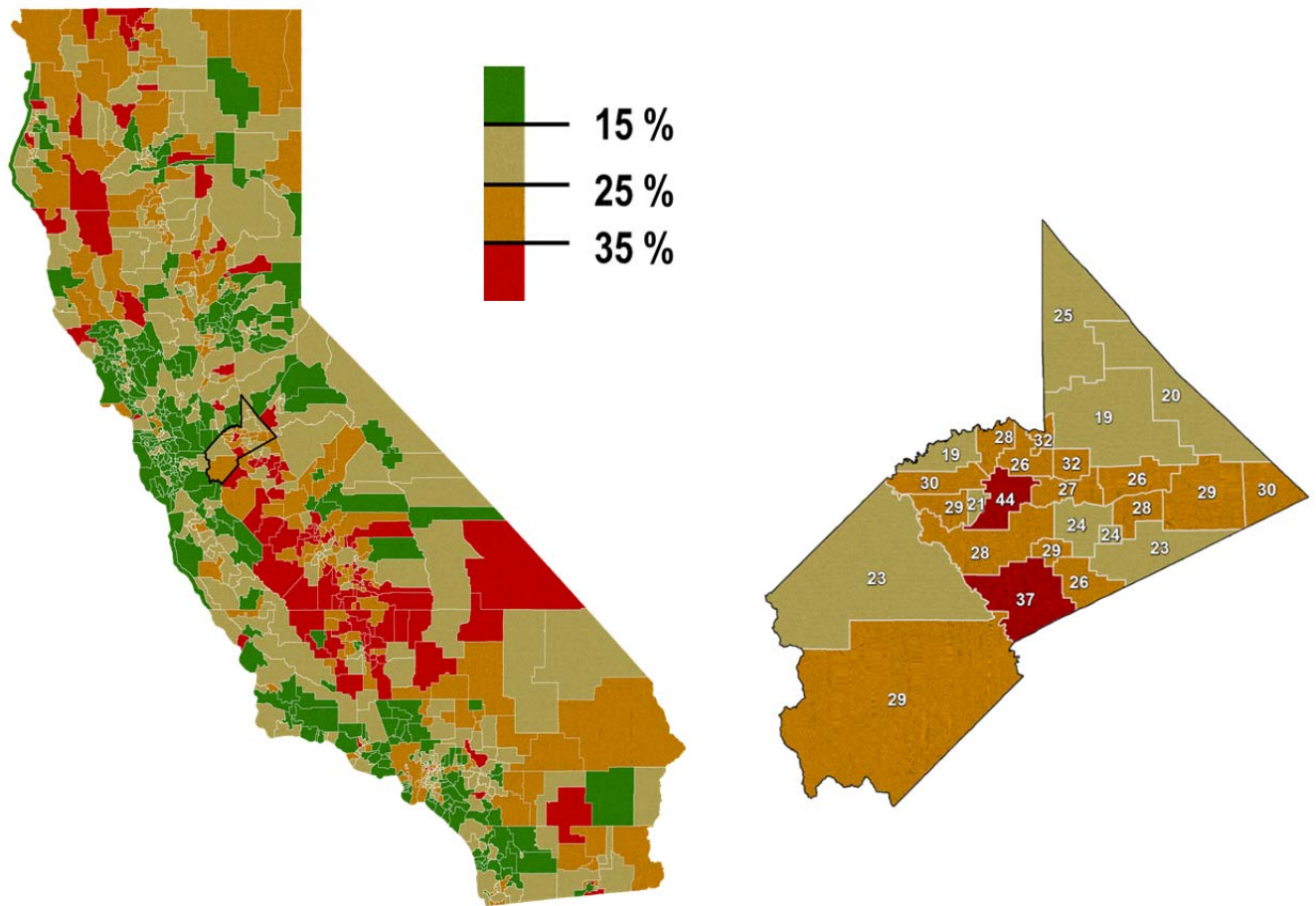


Figure 4. Student Poverty by School District.

Source of data: [census.gov/did/www/saipe/data/schools/data/2011.htm](https://www.census.gov/did/www/saipe/data/schools/data/2011.htm). Small Area Income and Poverty Estimates (SAIPE)

Summary Data Analysis & Related Findings

The summary of data analyzed for this project is divided into three sections that correspond to the data used in the analysis. The first section focuses on publically available data, its usefulness to the current project, as well as data limitations. The second section assesses geospatial data acquired from the project partners. The analysis of partner data includes information about how the data is collected by the organization, its utility in a spatial database, as well as data strengths and weaknesses. The third and final section summarizes data gathering and findings associated with qualitative measures. Because this project utilized so many different data types, we include maps, tables, and others visualizations to enhance explanation and understanding. Similar materials were shared with project staff and disseminated in public forums in order to receive feedback throughout the course of the project.

Public Data Summary

This study assessed several downloadable government agency datasets including the Decennial Census Data, the American Community Survey, the Public Use Microdata Area (PUMA), and the Small Area Income and Poverty Estimates (SAIPE). We developed several maps and other visuals using public data and shared these with our project partners. During our discussion we shared information data limitations, common user errors, and discussed the power of maps generated from the data that can be used to convey information about the organization and the socioeconomic situation of the local area and region. We were interested in getting their feedback about the usefulness of the data and maps to their respective organizations.

As stipulated in the U.S. Constitution, a population census is required every 10 years. The data is used for purposes such as apportioning seats in the House of Representatives, state redistricting and its used to determine the annual distribution of federal funds to states and localities. The data is fairly simple to work with and users can create maps and tables in the American FactFinder website. The Census Bureau also provides online access to basic data tools, mobile apps, and a visualization gallery that makes data available and more accessible to the public. Over the years, the Census Bureau has made their website much more user friendly and many of the basic mapping functions once reserved for highly-trained professional are now available to the public. From a research standpoint, the census offers a snapshot of the population at time the census is administered that can signal important social and economic trends. In general, project partners found the maps interesting in and of themselves, but did not indicate an immediate or even long term need for this type of information and none of the partners had used the census in their respective organizations.

The American Community Survey provides a timely ongoing survey that provides data annually. It is an improvement over the census long form, administered every decade, because it provides information every year giving communities and organizations the current information they need to plan investments and services. The ACS pre-tabulated (or summary) data are predefined tabulations of characteristics created by the Census Bureau in response to data user needs. The basic unit of analysis is a specific geographic entity -- state, county, etc. -- for which estimates of persons, families, households, or housing units in particular categories are provided (see Figure 5).

AGE BY LANGUAGE SPOKEN AT HOME
 Universe: Population 5 years and over ⓘ
 2011 American Community Survey 1-Year Estimates

	United States	
	Estimate	Margin of Error
Total:	291,524,091	+/-19,607
5 to 17 years:	53,842,873	+/-26,371
Speak only English	42,005,224	+/-59,939
Speak Spanish	8,470,505	+/-50,936
Speak other Indo-European languages	1,557,090	+/-28,580
Speak Asian and Pacific Island languages	1,325,053	+/-20,320
Speak other languages	485,001	+/-17,796
18 to 64 years:	196,296,192	+/-24,439
Speak only English	153,532,515	+/-101,096
Speak Spanish	26,399,097	+/-74,137
Speak other Indo-European languages	7,396,350	+/-55,878
Speak Asian and Pacific Island languages	7,024,203	+/-39,928
Speak other languages	1,944,027	+/-36,919
65 years and over:	41,385,026	+/-20,340
Speak only English	35,409,332	+/-31,665
Speak Spanish	2,710,185	+/-16,004
Speak other Indo-European languages	1,893,972	+/-21,747
Speak Asian and Pacific Island languages	1,136,208	+/-12,884
Speak other languages	235,329	+/-8,435

Figure 5. Example of America Community Survey (ACS) pretabulated data obtained from the the American FactFinder website:

<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

There are several concerns to keep in mind when using the ACS. The first big issue is a tradeoff between geographical and temporal resolution. The 1-year files only report data for units with at least 65,000 people, the 3-year aggregations report data for units with at least 20,000, and the 5-year aggregations report data for all units. So for census tract-level units one would use the latter aggregation. In short, 1-year estimates are best for analyzing large populations when the currency of the data is most important.

By contrast, 3- and 5-years estimates are more precise (less current) and better for analyzing small populations. To obtain data for the usual census geographical units one would use the summary file formats published by the Census from their American Factfinder website. The data can be difficult work with, in that a field name dictionary must be used in order to identify what each field represents. Users are encouraged to make us of the ACS Codebook/Data Dictionary in selecting variables and interpreting codes

<https://usa.ipums.org/usa/volii/codebooks.shtml>

We also assessed the utility of using PUMS data to analyze the impact of the arts in semi-rural regions like Stanislaus County. Unlike the tabulated data associated with ACS, PUMS data allows the user to determine the structure of the tabulation and the characteristic(s) to be tabulated. In microdata files, the unit of analysis is the individual housing unit or person, and the records include actual questionnaire responses (see Figure 6).

RT	SERIALNO	DIVISION	PUMA	REGION	ST	ADJHSG	AI
H	2007000002421	9	2500	4	6	1084729	:
H	2007000003093	9	2500	4	6	1084729	:
H	2007000007281	9	2500	4	6	1084729	:
H	2007000008430	9	2500	4	6	1084729	:
H	2007000011003	9	2500	4	6	1084729	:
H	2007000012550	9	2500	4	6	1084729	:
H	2007000013043	9	2500	4	6	1084729	:
H	2007000013281	9	2500	4	6	1084729	:
H	2007000017053	9	2500	4	6	1084729	:
H	2007000019071	9	2500	4	6	1084729	:
H	2007000019608	9	2500	4	6	1084729	:
H	2007000026839	9	2500	4	6	1084729	:
H	2007000027542	9	2500	4	6	1084729	:
H	2007000027951	9	2500	4	6	1084729	:
H	2007000028502	9	2500	4	6	1084729	:
H	2007000031049	9	2500	4	6	1084729	:
H	2007000031423	9	2500	4	6	1084729	:
H	2007000032736	9	2500	4	6	1084729	:
H	2007000035165	9	2500	4	6	1084729	:
H	2007000036361	9	2500	4	6	1084729	:
H	2007000037231	9	2500	4	6	1084729	:
H	2007000037608	9	2500	4	6	1084729	:

Figure 6. Example of a PUMS dataset.

For example, the PUMS data show how respondents answered questions on education, occupation, housing characteristics, and so forth. When working with microdata files, the data user specifies the tables to be produced and the geographic areas that are needed. The main reason to use PUMS is to create custom tabulations that you cannot find in the summary files such as the average personal earnings of an Asian female aged 25 to 44 with a college education. Some researchers have found that the PUMS files are especially useful for studying population groups for which published tables may be limited. For example Allen and Turner (2007) have used PUMS data to study the employment characteristics of migrants from California to those residents of destination states.

Though you get tremendous personal detail with PUMS, the result is often limited by the size of geographic units. The Census Bureau divides each state into a series of Public Use Microdata Areas, or PUMAs, each of which has a minimum population of 100,000. PUMAs are generally constructed based on county, neighborhood, and city boundaries and are not allowed to cross state lines. Typically, counties with large populations are subdivided into multiple PUMAs, while PUMAs in more rural areas are made up of groups of adjacent counties. PUMA boundaries can cross county boundaries and a PUMA can be made up of parts of several different counties. Various PUMA boundary files are available for download at <https://usa.ipums.org/usa/volii/boundaries.shtml>. It should be noted that it is not unusual to find non-contiguous PUMAs that are typically the result of combining separate cities into a PUMA. Figure 7 shows the PUMA boundaries for Stanislaus County.

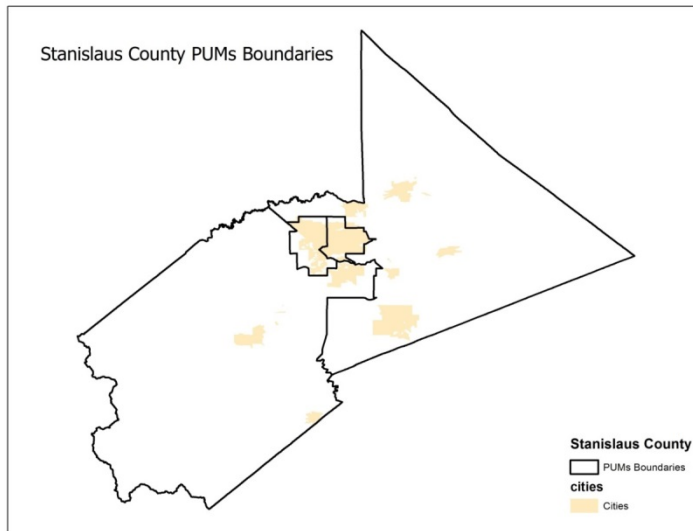


Figure 7. Stanislaus County PUMA Boundaries.

Users typically download PUMS data from the IPUMS web site at the University of Minnesota. If one uses this source they will provide SPSS or SAS syntax files that can read the raw data into either of those programs. Researchers and other users of PUMS data must also be sure to use the person weighting value (PERWT) to weight your person records to approximate the total counts. They also will need to acquire the State FIPS codes and the PUMA codes associated with the data. It is also possible to create PUMS tabulations through the Census Bureau's DataFerrett program. DataFerrett is a tool, developed by Census Bureau staff, for extracting data and producing tables from a wide range of data products generated by a number of federal government agencies.

The PUMS files are especially useful for studying population groups, such as those of Italian or Cambodian ancestry in California or for employment and industry groups like U.S. scientists and engineers or artists at the state and national level. In exchange for the rich data available in the PUMS, the Census Bureau limits the geographic detail that is available. Data users can produce customized estimates for small population groups like those mentioned above, but not for small geographic areas.

The U.S. Census, ACS and PUMS data sets are the most comprehensive, consistent and comparative. The problem is that they are difficult to work with, often requiring special software and high-level data manipulation and database management in order to create useable maps and other visualizations.

Additional geospatial data sets were acquired and assessed for their potential to scale and correlate with the art agency data including parcel data for Stanislaus County and Stanislaus County voter registration and voter turnout records. The county voter registration data provides information for every voter for the previous 20 elections at a variety of scales including city, zip code and precinct. Figures 8 and 9 provide visualizations of voter participation and turnout.

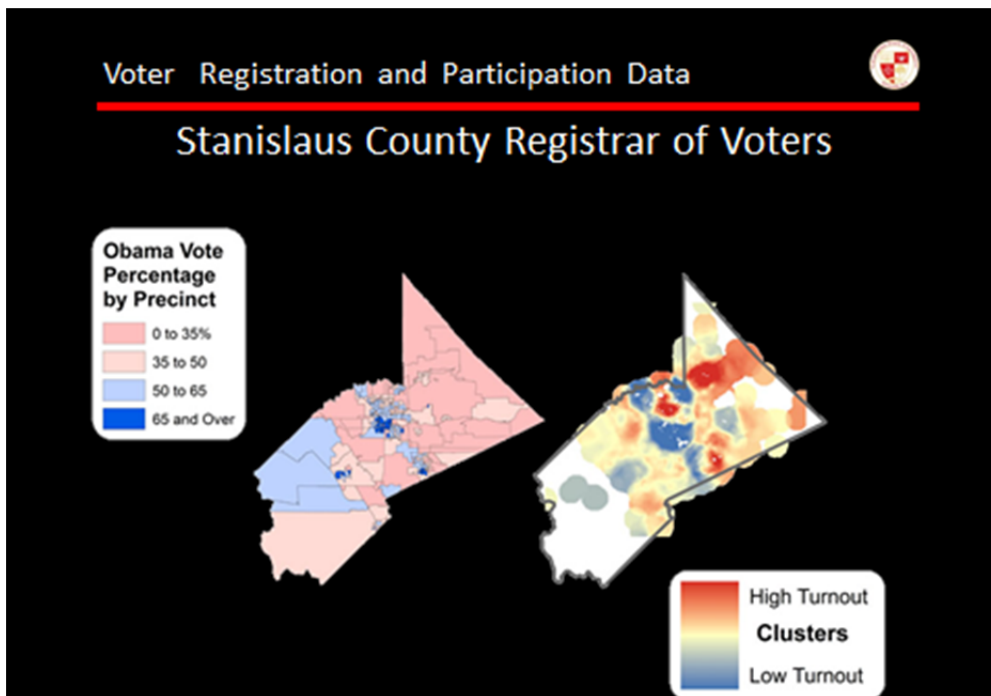


Figure 8. Source of data: Stanislaus County Registrar of Voters
<http://stanvote.com/returns.shtm>

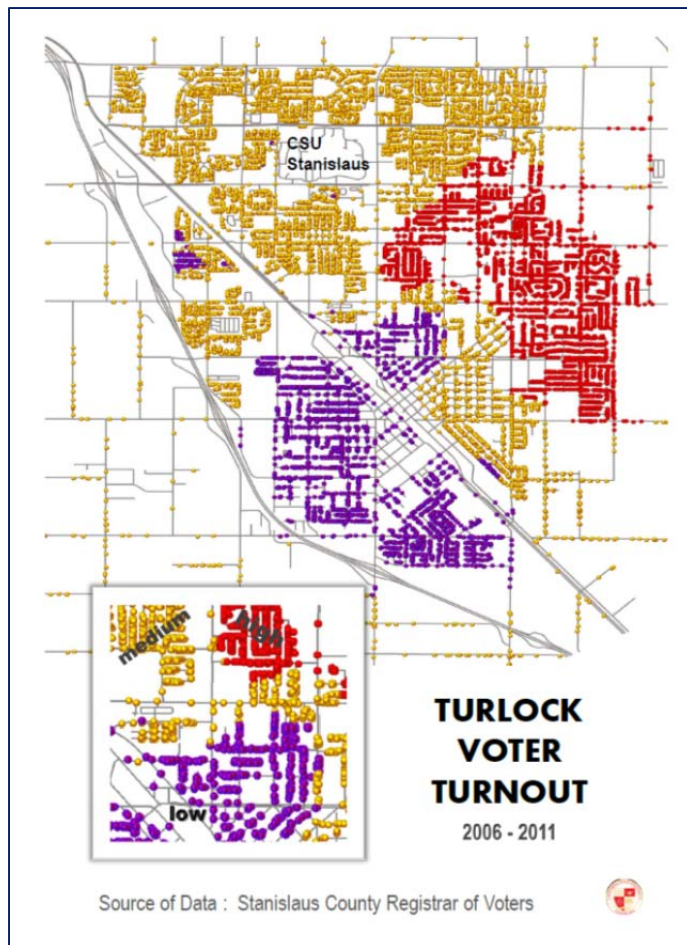


Figure 9. Source of data: Stanislaus County Registrar of Voters
<http://stanvote.com/returns.shtm>.

Assessor parcel data is another source of information that offers a wealth of information at the local scale. We used the dataset to map home size clusters (Figure 10), but other spatial attributes include whether or not the home is owner occupied, the type of land use and the year the property was built (Figure 11).

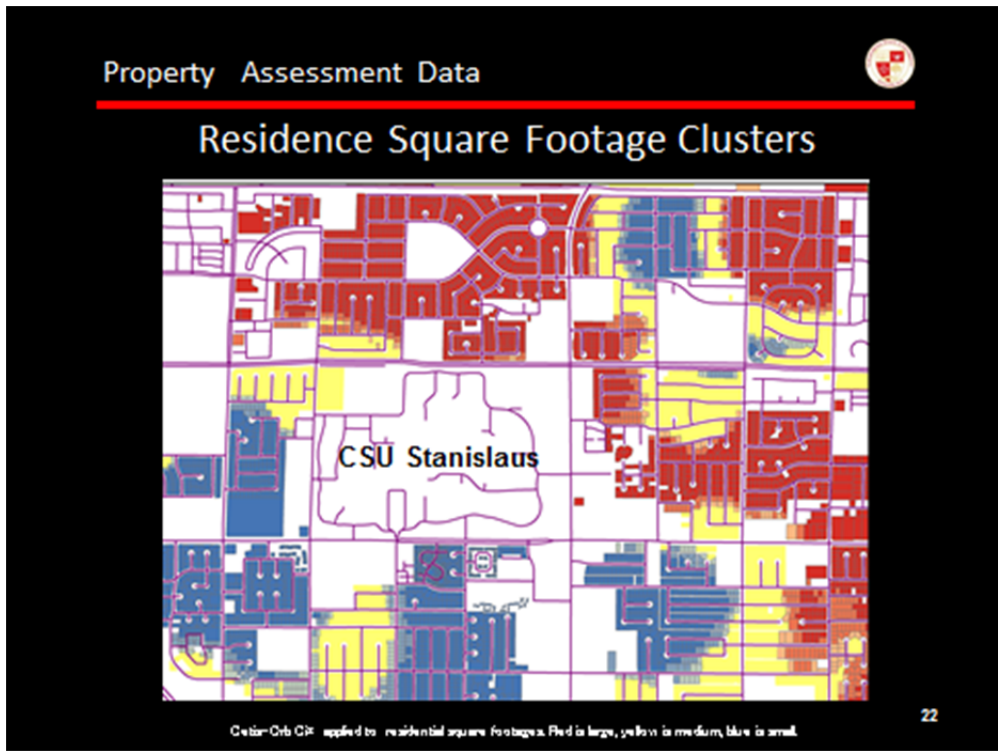


Figure 10. Source of data: Stanislaus County Assessor <http://www.stancounty.com/assessor/>. Spatial statistics referred to as “hot spot” analysis was applied to residential square footages. Red designates clusters of large square footage, yellow is medium, and blue is small.

Stanislaus County Assessor Public Inquiry [Back](#)

General Information					
Assessment	041-005-001-000	Parcel Number	041-005-001-000		
Current Document	2004R0001805	Current Document Date	01/07/2004		
Land Sq Ft	108,464.00	Tax Rate Area (TRA)	054-009		
Taxability	800 - PROP 8 REDUCTION				
Land Use	121 - SINGLE FAMILY W/EXTRA LAND				
Assessee	MEDA JESUS				
Roll Values as of: January 1st, 2013					
Land	\$95,000	Personal Property	\$0		
Structure(s)	\$24,500	Personal Property (MH)	\$0		
Fixtures	\$0	Homeowner Exemption	\$7,000		
Growing Improvements	\$0	Other Exemption(s)	\$0		
Total Land & Improvements	\$119,500	Net Assessment	\$112,500		
Ownership					
Owner Name	Own %	Pri	Granting Doc No.	Title Type	RT Code
MEDA JESUS	100.00%	Y	2004R0001805		
Physical Characteristics					
Land Use Category 4 - Building # 1					
Parcel Number	041-005-001-000				
Commercial Units	0				
Industrial Units	0				
Residential Units	1				
Bedrooms	2				
Bathrooms	1				
Fireplaces	0				
Year Built	1936				
Quality	D45				
Building Type	RS - Residential				
EffectiveYear	1936				
Building Size	693 sq ft				
Stories	0				
SqFt Unfinished	0				
Garage Type	1 car Garage				
Heating	W - Wall				
Cooling	-				
Pools	-				

Figure 11. Sample Assessor Parcel data sheet.

Project Partner Data Summary

Three art agencies in Stanislaus County provided the geospatial data used in this project including the Modesto Art Museum (MAM), the Carnegie Arts Center (CAC), California State University Stanislaus School of Arts (SOA).

The **Modesto Art Museum (MAM)** is a virtual museum that also hosts inexpensive educational and art events at galleries, shops, theaters, street fairs, parks, and museums located in and close to Modesto, the largest city in Stanislaus County (pop 200,000). The MAM participant data was collected at the sixth annual Modesto International Architecture Festival (MAIF), co-hosted by the American Institute of Architects-Sierra Valley chapter. The MAIF took place from September 14-22, 2013, and consisted of thirty different events at multiple locations, that included three architecture film nights, two lectures, seven exhibits, twelve walking tours, and six other events. We utilized audience-intercept surveys which were conducted at eight of the festival events (Figure 12).

~ 290
@ 7:00 AM

**Modesto Reel Food Film Festival
Audience Favorite Award Ballot**

After viewing the movies, check the one you consider your favorite. Your ballot will be collected in the lobby as you leave the theatre.

Obsessive: Soda Pop, Meredith Arthur & Eric Slatkin, United States, 13 minutes; One man, one store, more than 500 varieties of soda pop

Naturally Risen, Michael Evans, United States, 5 minutes
A sensuous visual exploration of pizza

Oakdale Testicle Festival, Kevin Fox, United States, 6 minutes
A look behind the scenes of a nutty festival where everyone has a ball

In Search of the Heart of Chocolate, Sarah Feinbloom, United States, 25 minutes; A romp through the passionate world of chocolate

Intermission

Cravings, Andreas Lindergard and Christian Hallman, Sweden, 11 minutes; Does he want her, or does he want her food?

La Saint Festin (Saint Feast Day), Leo Marchand, Annelaure Daffis, France, 16 min.; It's Saint Feast Day, the greatest celebration of Ogres

What a Freegan Waste!, Craig Rook, United Kingdom, 26 minutes
A documentary exploring an alternative way of recycling

You can help us plan future festivals by answering the following questions. Thank you.

1. The primary way I learned about the festival: (Circle One)
Friends Modesto Bee Newspaper Postcard Poster Facebook
Museum Web Site State Web Site Film Society Other _____

2. My zip code 95350 3. Age 52

4. Sex (Circle One) Male Female Other _____

The Modesto Reel Food Film Festival is sponsored by
The California Poultry Federation
The reception sponsors are:
California Poultry Federation, California Milk Advisory Board,
Modesto Convention and Visitors Bureau, The Dented Chef, Janet's Flowers
Thank you!

The Modesto Reel Food Film Festival is produced by
Modesto Film Society State Theatre Modesto Art Museum

Figure 12. Sample audience –intercept survey form used to collect attendee data at the Modesto International Architecture Festival.

Attendees were asked to complete anonymous half-sheet survey forms which asked (1) how they learned of the event, (2) ZIP Code, (3) age, and (4) gender. The survey yielded 521 survey forms with 81 valid unique California ZIP Codes (Figures 13, 14 and 15).

Modesto International Architecture Festival 2013		
Event	Surveyed	Total Attendance
Walking Tour of Downtown Modesto	46	48
Walking Tour of Graceada Park Area	48	51
Opening Night Reception	52	66
Lecture – Architecture Café with Lorie Garcia	13	17
Instagram Architecture Photo Exhibit	73	103
Architecture Movie Night	187	265
AIA Sierra Valley Awards Night	78	114
Lecture – Carnegie Art Center, Turlock	24	43
Totals	521	707

Figure 13. Table showing results from audience-intercept survey for eight of the Modesto International Architecture Festival events.

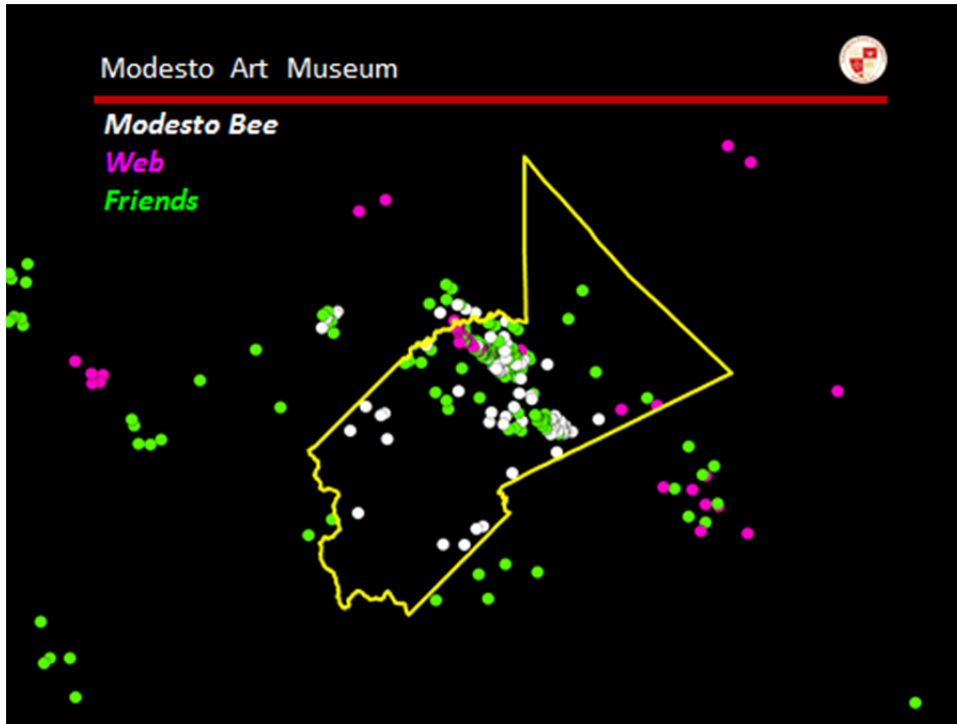


Figure 14. How attendees “heard” about the event. The maps indicates a tightly clustered pattern for patrons learning about the festival through the local newspaper (Modesto Bee) and a dispersed pattern for attendees who learned of the event from friend and via the Internet.

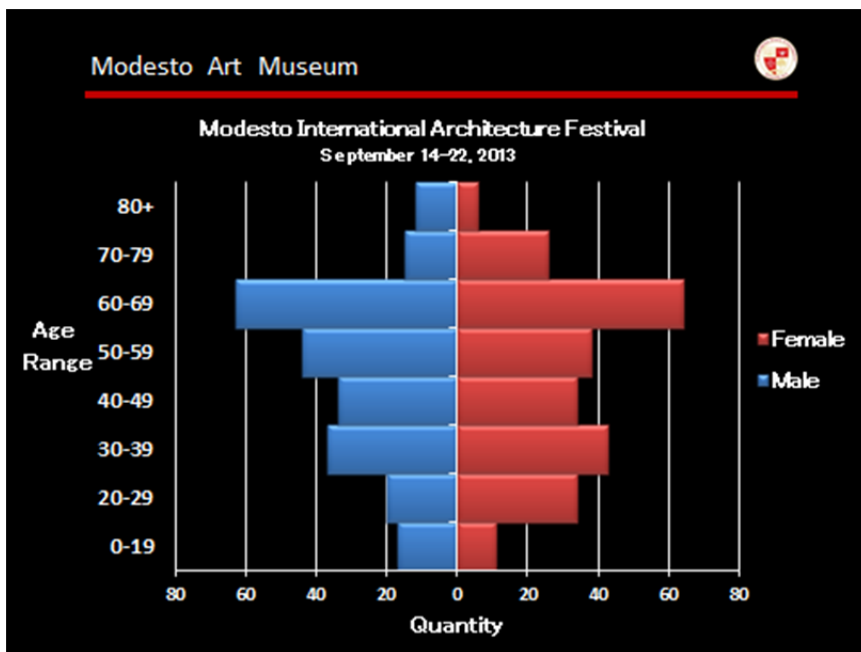


Figure 15. The population pyramid highlights the distribution of attendees by age and the proportion of males to females in each age group.

The data that the MAM collects is primarily used for planning purposes for the International Festival and could be improved if data collection expands beyond this single event. The data collected through audience-intercept survey was limited to only eight of the thirty events and more survey coverage would likely have provided more robust results. Another weakness of the survey was that there was no mechanism for identifying whether attendees who participated in multiple festival events filled out more than one survey. There was some indication that the number of valid surveys depended on the type of event (i.e. walking tours had higher percentage yields than single location events). The use of zip-code level data is common and important because it masks the identity of patrons, but consequently negates the use of neighborhood level GIS datasets that could potentially provide a much more detailed profile of art patrons.

The **Carnegie Arts Center (CAC)** is located in an older section of Turlock, the second largest city in Stanislaus County (pop 70,000). From 1916 until 1968, part of CAC’s current building served as the Turlock City Library, one of 1,600 libraries built by Andrew Carnegie. In 1979, that building became an arts center, and in 2005, a fire destroyed the interior. The City of Turlock and the non-profit Carnegie Arts Center Foundation collaborated to rebuild the Center, and the current expanded facility opened in September of 2011. Now entirely operated by the Foundation, the events hosted include exhibitions, classes, lectures, music, dance, and school field trips.

For a relatively new art center, the Carnegie has instituted several data-gathering procedures and processes that relate to their primary mission and programming, including fundraising, art classes, and exhibitions. The CAC provided a list of zip-codes of all donors who made a donation since fundraising began in 2010. Also included was a list of zip-codes for anyone who enrolled in a class at the CAC since the September 2011 opening. The data included the number of students and donors (Figure 16) The CAC also compiled a list of zip-codes from visitor sign-in logs since its opening in 2011 (Figure 17).

Description	Quantity	Unique California ZIP Codes
Donors	586	68
Students	352	40

Figure 16. Zip-codes for CAC donors and art class attendees.

Time period	Number of visitors who signed the register	Unique California ZIP Codes
2011 (opened in September)	2856	152
2012	368	49
2013 (starting at 9/19/2013)	223	93
1/3-15/2014	92	43

Figure 17. Zip-codes from visitor sign-in logs since its opening in 2011-2014.

The CAC has been collecting zip codes data since their opening in 2011 and the dataset was geocoded using a zip-code base map (Figure 18). The results show that the number of patrons is drawn primarily from Turlock, where CAC is located and to a lesser degree from Modesto. We visited CAC on several occasions and noted that not all visitors made entries into the registry and that there were significant time gaps in the dataset. Additionally, some data included city and town names in lieu of zip-codes and in those cases the record could not be used. Similar to the MAM, the collection of zip-code data as opposed to street address negates the use of neighborhood level GIS datasets that could potentially provide a much more detailed profile of art patrons and thus a better measure of the impact of arts programming.

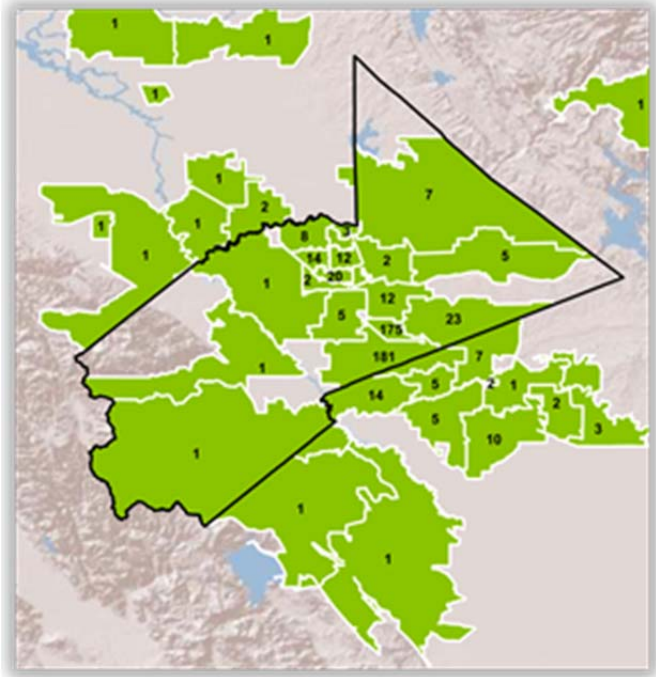


Figure 18. CAC geocoded zip-codes from visitor sign-in logs 2011-2014.

The **School of the Arts (SOA)** at California State University (CSU) Stanislaus is located in Turlock. Within the California State University System, it is one of the smaller public universities. Among the nearly 8000 students, many are the first in their family to attend college. CSU Stanislaus is a Hispanic Serving Institution and many students commute to campus from both urban and rural locales in the six-county service region. The SOA consists of three distinct programs – Art, Music, and Theater. The School’s events include concerts, recitals, and plays and tickets to these events incorporate a two-tier pricing systems with one price for students and another for the general public.

The SOA provided detailed credit card transactions for ticket sales from 2010-2013. They also provided art gallery visitors log sign-in data to the free-admission art gallery. The credit card transactions fields included the date and time of ticket purchase, the name of the event, the date-time when the event took place, and credit card billing addresses. The Art Gallery sign-in visitor data included addresses only. A majority of the SOA patrons were repeat customers, thus from a total number of 30,316 individual records the data netted 3599 unique valid addresses suitable for geocoding (Figures 19, 20, and 21).

The following table is a summary of data provided by CSU Stanislaus School of Arts.

Group	Description	Dates	Number of events	Number of records	Valid Unique Addresses
Art	Art Gallery Visitors Log	N/A	N/A	580	516
Art	Credit Card Transactions	8/24/2012 – 6/21/2013	27	48	29
Music	Credit Card Transactions	9/24/2010- 11/1/2013	151	18103	2180
Theater	Credit Card Transactions	10/1/2010- 10/30/2013	157	11585	874
Totals				30316	3599

Figure 19. SOA data collected from credit-card transactions, 2010-2013.

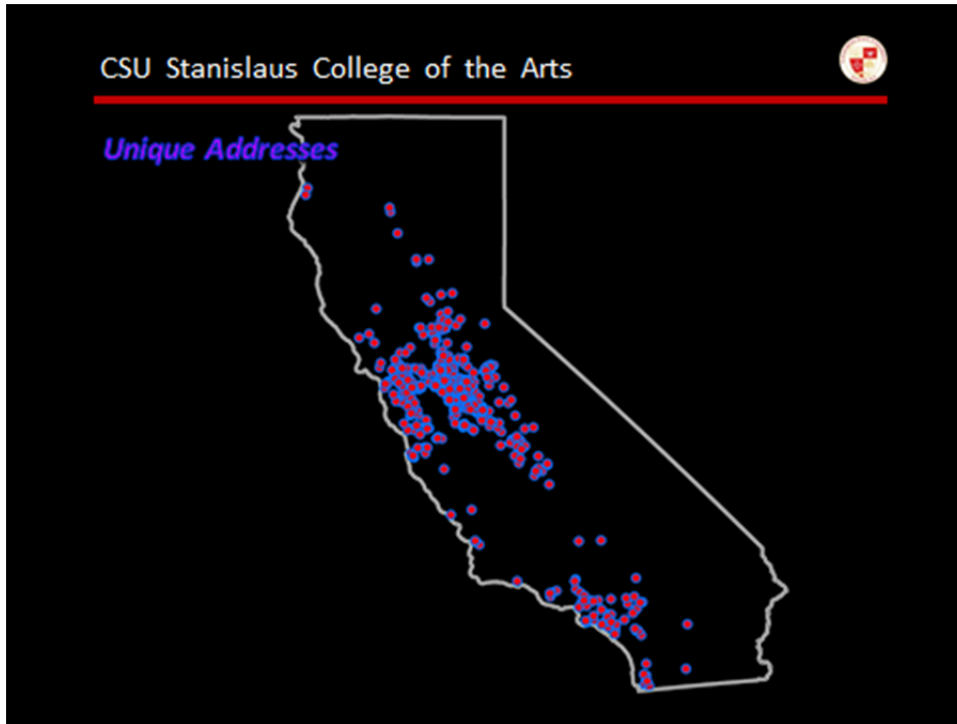


Figure 20. Spatial pattern of unique addresses for School of the Arts patrons. The addresses were geocoded at gpsvisualizer.com using the MapQuest license option.

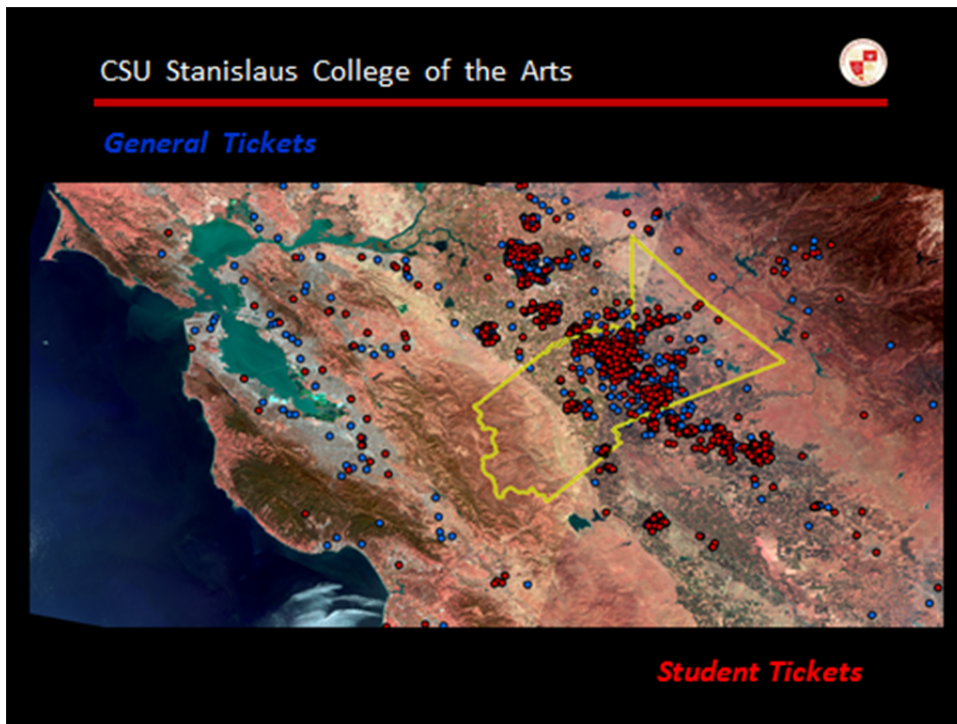


Figure 21. Spatial pattern of unique addresses for School of the Arts patrons showing ticket sales to the general public and ticket sales to university students. The addresses were geocoded at gpsvisualizer.com using the MapQuest license option.

Of the three datasets provided by project partners, the SOA credit card address data is the most useful for spatial analysis. The SOA patron address data scales with neighborhood level GIS datasets (see for example Figures 9 and 10 above) which could potentially provide a detailed enough profile of art patrons for analysis of the impact of art programming. The series of maps below show several interesting spatial patterns (Figure 22). First, the impact of Art Gallery, as measured by patrons attending free-admission showings, indicates a more concentrated pattern with many visitors coming from neighborhoods close to campus, as well as a larger concentration from older established neighborhood where the majority of homes are owner-occupied. Data for both the music and theater events is more dispersed with modest clustering in the newer neighborhood developments (post-2000) of north Turlock. The most obvious spatial pattern revealed in the three maps is the lack of arts impact in West Turlock. Highway and railroad construction in Turlock have created a distinct “westside” that is characterized by lower participation in the SOA’s programs and lower voter participation (see Figure 9). The city’s westside is largely Hispanic/Latino and this distinctive pattern is common in cities and towns up and down the northern San Joaquin Valley.

Additional strengths of the SOA datasets included the ability to use the Lookup Table for event ticket prices making it possible to distinguish between student and public ticket sales, as well as the type of event (art, music, theater). Additionally, the online service that is used to purchase tickets for SOA events is modifiable and therefore the SOA may want to consider using this option to gain additional information about the impact their programs and activities are having in the region.

In addition to the SOA’s data strengths, we also noted a few weaknesses. First, the visitor register was unavailable during several visits to the Art Gallery. When the visitor register was available we found that there was no effort made to request the date or the time for the visitor’s entry. Addresses associated with the detailed credit card dataset are billing addresses which may or may not be the same as residential addresses and no data is available for cash transactions. Finally, while the data can be sorted by category of event (art, music, theater) the data is not available for total ticket sales by individual event (e.g. spring jazz concert). The credit card records required significant cleanup for geocoding. For example, not all street addresses matched to cities or the data was entered into the wrong columns. Other problems are inherent to mapping address and common when using a GIS. For instance, billing addresses associated with a post office box cannot be geocoded. Likewise geocoding does not make a geographic distinction for apartment numbers.

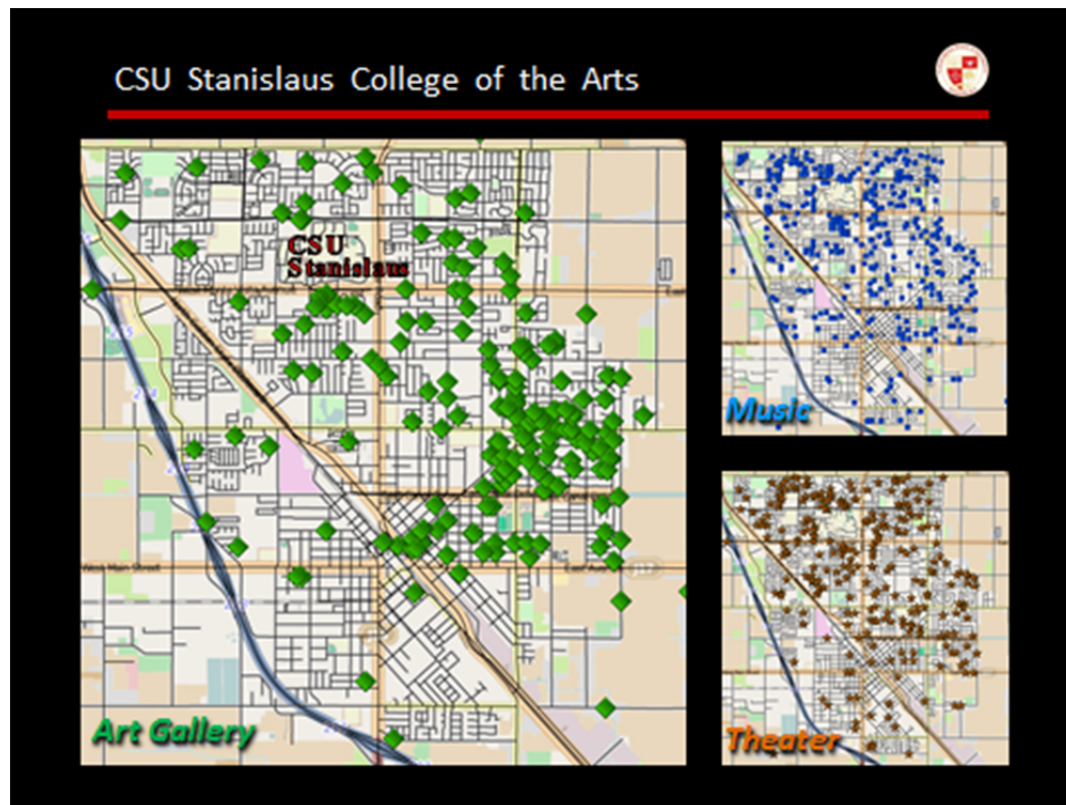


Figure 22. Spatial pattern of unique addresses for School of the Arts patrons by category of event (Art Gallery, Theater, Music). The addresses were geocoded at gpsvisualizer.com using the MapQuest license option.

Our collection and analysis of project partner data revealed several interesting results. First and not surprisingly, data collection by art providers is primarily focused on events. Providers are most interested in gathering information that can help them to plan similar events in the future and to learn if their promotional efforts worked. There is a secondary interest in learning more about their patrons. For example, MAM asks questions about age and gender in their surveys. The most common spatial information collected is at the scale of city or zip-code and in visitor logs and both CAC and MAM had no plans to seek patron data at a more detailed scale. Unfortunately, for these two organizations mapping data by zip-code for Stanislaus County does not reveal the spatial patterning one needs to combine with other publicly available data. As Figure 23 reveals, zip codes districts are too general to discern any meaningful patterns with the populated areas of the county.

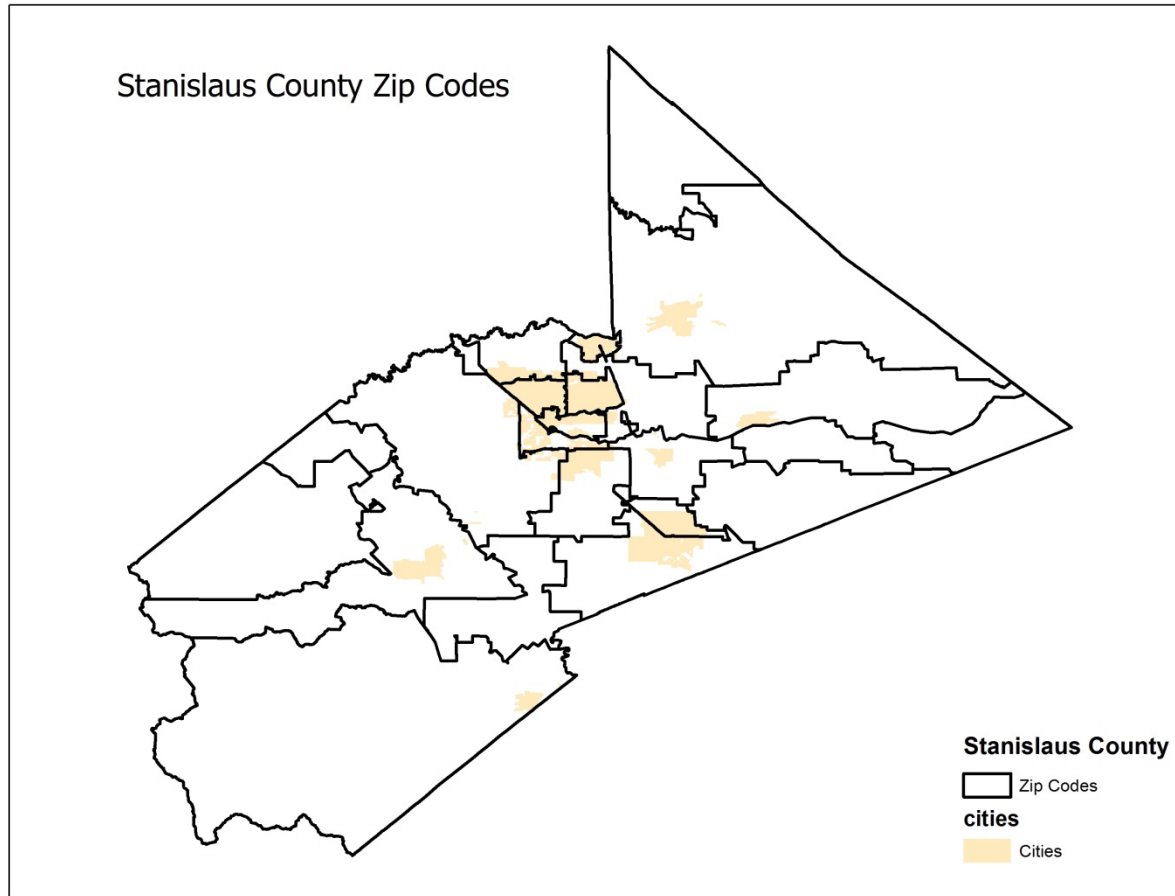


Figure 23. Stanislaus County Zip Codes overlaid on cities.

The two larger cities of Stanislaus County, Modesto and Turlock have only five and two unique zip code districts respectively. This results in the situation that some neighborhoods of a similar vintage may share a common zip code, but the more common manifestation is that few homogenous neighborhoods exist within zip code boundaries. Driving through the same zip code, one may pass by an expansive multistory country estate nestled among mature landscaping and manmade lakes, and a few blocks later encounter residences that lack sidewalks and are characterized by economic disparity. While census zip code data would seem a perfect match to the data collected by MAM and CAC, knowing an art patron's zip code actually reveals little about that art patron in a more rural region like Stanislaus County. A more useful scale of analysis for the purposes of revealing spatial patterns would be that of the census tract (Figure 24) or even the census block level that results far greater spatial differentiation, but requires more detailed patron information at the neighborhood (individual address) level.

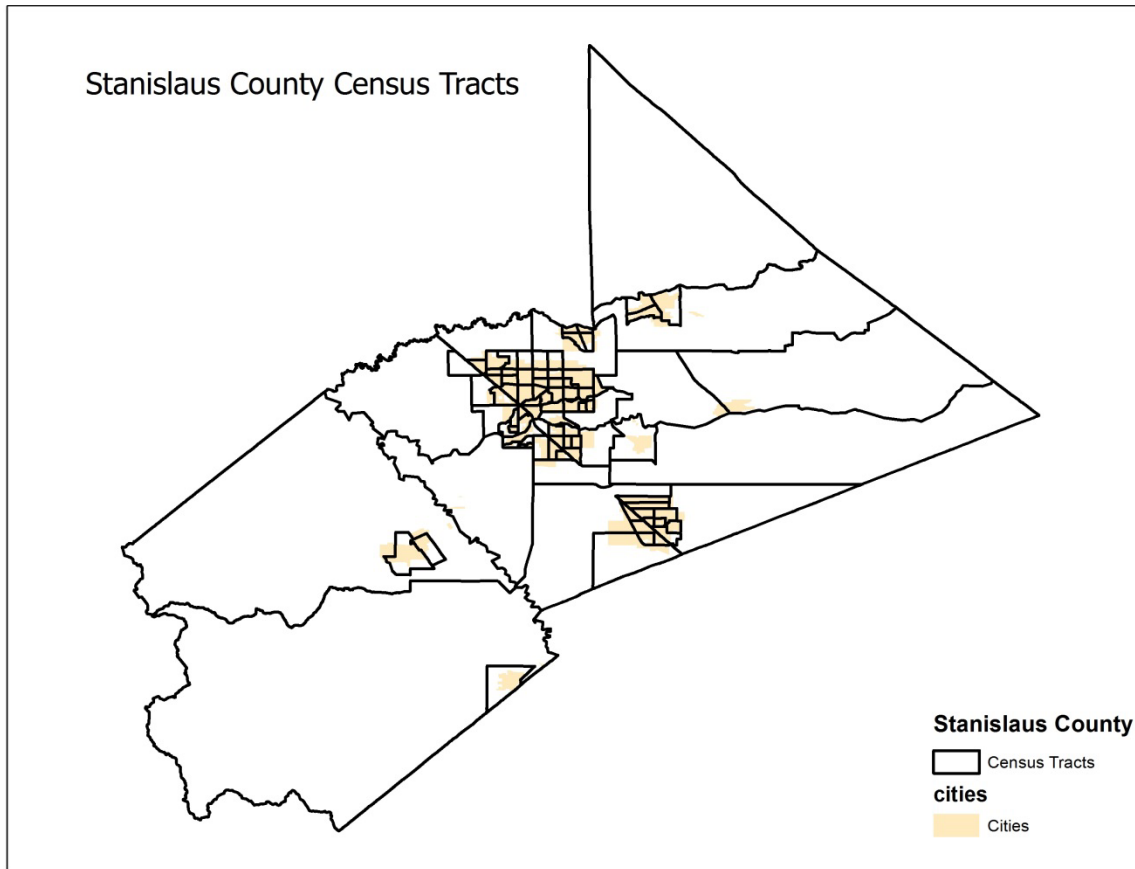


Figure 24. Census tract boundary areas for Stanislaus County.

Mapping the boundaries for the various public datasets assessed in this project reveals the difficulty in creating meaningful visualizations from publicly available sources (Figure 25). The main reason is that aggregated data rarely coincides with neat, orderly boundaries in the phenomenon being mapped. The underlying problem is whether statistical relationships change depending on the scale of analysis (zip code, census tract, etc.). This changing relationship can be the product of aggregation error or a true difference in the nature of the phenomena at different scales of analysis - or scale dependent relationships. The fundamental question is whether the aggregation of the data imposes a bias. The partner data utilized for this project was largely aggregated by zip code and therefore can only be combined with data at the same level of precision. The zip code data cannot be combined with data sets that have higher precision (census tract, etc.) without introducing bias and error into our maps. In short, finer scale data like addresses and census block data can be aggregated, while coarser scale data (country level, zip code) cannot be easily divided.

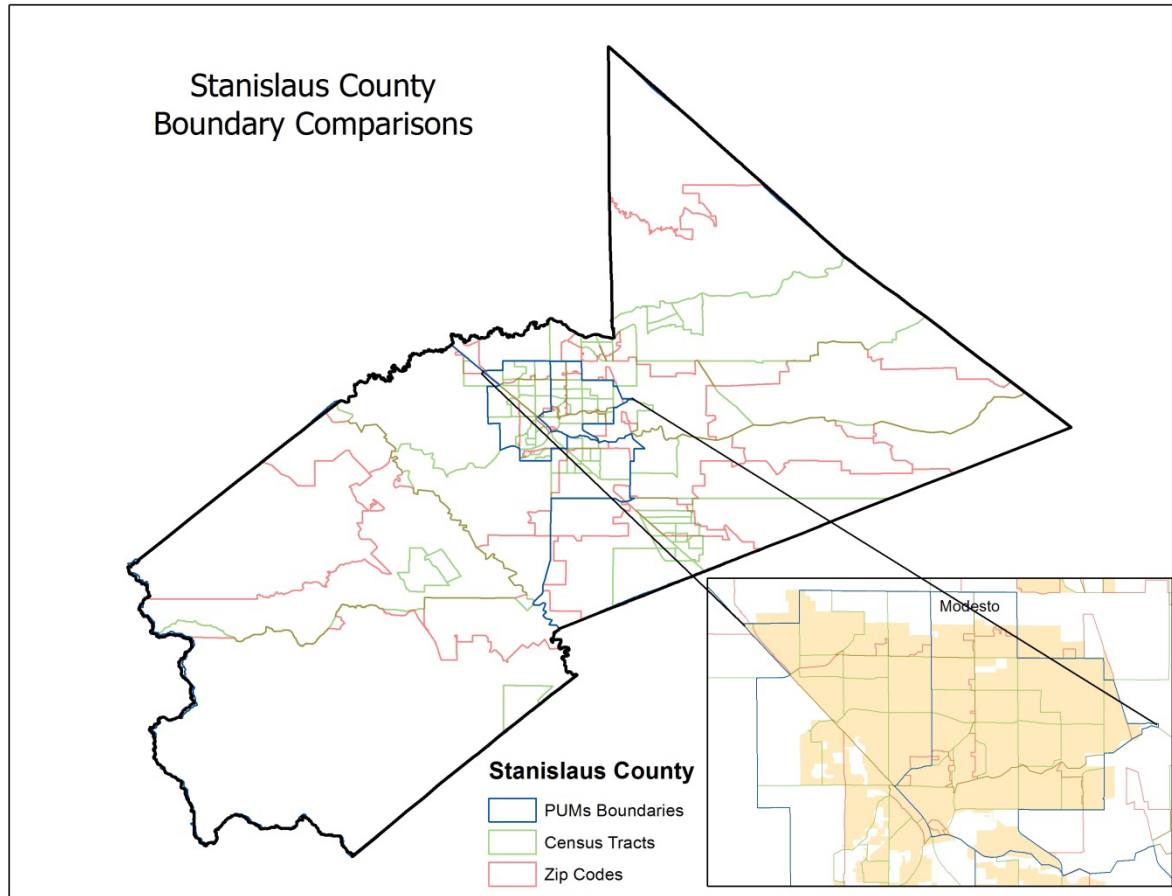


Figure 25. Boundary comparisons for publicly available data in Stanislaus County.

Having access to more detailed address information about art agency clients might have furthered our goals as researchers in measuring the impact of the arts in our region, but we are sympathetic to the art agencies decision to collect and/or provide zip code data so as to protect the identity and privacy of their donors and patrons.

The individual address data from the SOA is an example of the level of precision that makes spatial analysis meaningful. Because residential addresses provide the highest level of precision, they can be combined with dataset that have lower levels of precision. When individual data is grouped into units (census tract, county, etc.) for analysis, another bias may occur known as the modifiable areal unit problem or MAUP. The MAUP arises when individual data points are grouped together for ease of analysis and understanding. For example, if art patron data is placed into census tracts, the pattern that is revealed is as much an artifact of geographical division (the census tract) as it is of the original data. This problem can be especially acute when the data points are located near the boundaries of the zone, the idea being that if the boundaries were to change slightly, the results would change. The MAUP is and an unavoidable issue, but one that is often overlooked in spatial analysis. The availability of public data and the ease of generating maps at a variety of scales from that data make awareness the MAUP even more important to researchers.

Qualitative Data Summary

The research design included a second level of qualitative data gathering and analysis in order to explore the underrepresentation of minority groups in art making and art participation. Qualitative measures included interviews with college art faculty, art teachers, art program directors in the Turlock Unified School District (TUSD) and Modesto Unified School District (MUSD), ethnic community organizations such as the Bridge Community Center in Modesto, and city art commissions within Stanislaus County. Qualitative data gathering focused on cultural arts programming with particular attention focused on ethnic communities and schools in minority serving neighborhoods.

Our qualitative data gathering canvassed two broad categories of art providers including, *institutional* providers which was primarily made of schools with some form of art programming; and *non-institutional* providers which included any organization, club or community center with art programming. In order to identify art programming among the institutional providers, we obtained a list of contact numbers for all the after school programs in Stanislaus County from the Stanislaus County Office of Education (SCOE). The list reveals a puzzling mix of administrative structures and aggregations from one school district to the next. For example, Ceres Unified School District lists 15 schools for one contact, Modesto Unified School District includes 23 schools each with its own contact, while Turlock Unified School District only lists six of 15 schools and runs their afterschool program through the City of Turlock's Parks and Recreation Office. Additionally, we generated our own contact list based on web searches of K12 schools in the county. This web search resulted in 34 additional contact names and oftentimes listed a school principal or assistant superintendent as the contact person. We utilized web-searches, social media (e.g. Facebook and Instagram) and snowball sampling to identify non-institutional providers. This approach resulted in 11 providers representing many of the area's cultural and heritage groups.

Institutional providers were contacted by email and asked to briefly describe their art education program, whether or not their target a particular group of students, and if they focus on a specialized area of the arts. We also requested that they share their ideas about how to increase arts programming or the impact of the arts in Stanislaus County. The response we received was wide-ranging in terms of the structure and staffing of programs, and program resources. For example the high end of the spectrum includes an elementary school with a Visual and Performing Arts (VPA) magnet program that provides arts education in all four of the arts disciplines. In addition, the program is housed in a facility that was specifically designed to house arts education that includes theatre lighting, backdrops, art supplies, a kiln, dance equipment and more. The program is staffed by credentialed faculty in one or more of the VPA areas who provide both direct and integrated arts instructions to students in grades K-6. The other end of the continuum includes voluntary programs like *Ballet Folklorico Los Luceros de Osborn* that rely on volunteers who teach traditional Mexican folk dance and singing at a two-way Spanish language immersion school in a predominately Hispanic/Latino neighborhood. The program was created by a staff member trained in traditional Mexican folk

dancing. In addition to learning and performing traditional Mexican folk dances, students learn about traditional costuming and make-up, and they explore various regional customs and cultural practices in Mexico. The program receives no outside funding, but relies on volunteers and donations for costumes, folk dance props, make-up and shoes. The program serves K-6 students who attend Osborn Elementary School. They perform on campus and in the local community for non-profit events (e.g. Relay for Life, Migrant Education Program, Cesar Chavez Day), as well as private events.

Programs like those associated with the Whitmore Charter School of the Arts and Technology lie somewhere between these two extremes. Whitmore Charter is a public charter school run under a local school district with an emphasis on the arts and technology for K-8 grades. The program promotes all four disciplines of the arts at the elementary level and then a more in-depth specialty at the middle school level. The targeted age group is K-5 for weekly classes, and 6-8 grade students for daily, elective courses.

Providers in the non-institutional group were also contacted through email, and in three instances we were able to meet with representatives in person. Interviews focused on the history of the group, the group's mission and the primary community they served, and their type of specialty art/type of art programming. We were also interested to learn if non-institutional providers engaged in outreach activities or other practices to sustain their organization.

The non-institutional providers shared several common features. First, the majority of groups we surveyed were strongly tied to organizations representing the region's diverse cultural-heritage groups, including South Asian Indians, Southeast Asians (Cambodian and Hmong) and Mexico. The organizations also had a similar focus and shared purpose. An often-stated goal for many groups was that of cultural maintenance while sharing knowledge of the group with the larger host society. These non-profit organizations promote the arts by offering free classes to youth and they support their operations through volunteerism and fundraising activities. They perform at fairs, local festivals, and farmers' markets and generally promote their performances through social media.

Ballet Folklorico Anahuac (BFA) is a non-profit cultural group whose mission is to promote Mexican culture through the art of dance and community engagement. One of the main goals of BFA is to provide a second family to the youth of Modesto, sharing the love of Mexican cultural dances and the culture in general. BFA started around 13 years ago and has grown from a few youth to over 70 teenage members. In the early years, the group was supported by a local church whose members also wanted to have their children learn about the culture through dance. The group performs at local events, festivals in the Bay Area and has traveled as far as Jalisco State (Mexico) to participate in dance competitions. Newcomers learn about the organization through word-of-mouth and from seeing the BFA perform in festivals and dance competitions. Their outreach also includes a Facebook page.

In addition to providing opportunities to engage area youth in the arts, the non-institutional providers offer an important bridge to the area's local ethnic communities that help to maintain

and strengthen intra-group cultural ties while also building inroads to the host culture. The impact of the arts as a cultural bridge is perhaps best captured by the following comment from a youth leader.

There's that cultural divide between family members. Our overall mission here is to teach the youth their Cambodian culture, while teaching their parents and grandparents, the culture of America."

– K.C. Chan, Khmer Youth of Modesto

Conclusions

Taken together, the MapGIS project explored the potential use of GIS and cartographic representation to measure the impact of the arts in Stanislaus County. We collected and assessed publicly available data, project partner data and then shared the results with the project partners, community members, and other researchers. The work was valued by project partners and the arts community as evidenced by feedback on our presentations. Throughout the project, the research team noted many ways to improve data collection and discussed opportunities to make the visualization results more useful to the arts community.

When we began this project, we anticipated that the results of data collection, mapping and spatial analysis would reveal significant differences in art participation and that our findings might reveal causal relationships. A GIS is the ideal technology for understanding dependent and independent variables related to the patterns revealed in spatial data including such characteristics as mobility, core-periphery relationships, and scaling of phenomena (local, regional, global). A GIS is also useful for understanding how much of the impact and participation or lack of impact/participation can be attributed to location variables. A key tool of the GIS is the ability to display and analyze data with cartographic representation. Our examination of several publically available data sets and project partner data highlighted both the potential for using spatial data to understand the impact of the arts, as well as the limitations for spatial analysis. The project partners we worked with valued the maps and other visualizations as tools for decision-making, particularly in the area of marketing and fundraising. As a decision-making tool, spatial data in the form of maps, graphs and other visualizations provide both professionals and community members alike a means of exploring and understanding data that was previously inaccessible. As stated in earlier portions of this report, the project team also noted several limitations in both the public and partner data. On balance, we believe that the opportunities to use spatial knowledge along with the development of new tools and technologies far outweigh the data limitations we encountered. The following summary addresses ways that art organizations and institutions can utilize spatial information and new technologies to support their activities, immediate needs and goals for the future.

In the last decade, urban planning and policy-making has been increasingly guided by the growing adoption and use of GIS and digital spatial data by a multitude of new users, including community organizations and institutions. Likewise, the field of community GIS has been expanding over the last decade and the availability of new tools that provide access to non-GIS professionals make this more possible. Therefore, it is not surprising that a growing number of community organizations are seeing the benefit of collecting and using data, especially spatial data, to create *spatial narratives* as a means to communicate or report about their needs, goals and/or accomplishments. In some cases, community groups have found that they are able to combine resources they may already possess like visual images such as photographs, maps, and charts along with public data. In other instances, organizations have focused on collecting new data for a specific interest or particular project. Once the resources have been collected, staff members of these organizations typically use all of these forms of visualization within a GIS to produce spatial knowledge or narratives to communicate their needs or report their activities. Visualization is a way of expressing knowledge about place and spatial relations and also a way

of creating spatial meaning through exploration and interpretation. The result is a powerful means for community organizations to produce and communicate spatial knowledge that support their activities, and indeed, we found this to be the case with our project partners. In our presentations to project partners, the GIS-based maps and visualizations served as a common starting point to develop shared knowledge about the impact of arts in our region, conditions and capacities in the art community, as well as ways to use spatial data to inform and support a diverse range of projects, arguments, and to guide decision-making.

Similar to other community organizations, art organizations and institutions make choices about what knowledge to present and how, with the goal of influencing decision-makers with evidence to support their claims. Some have argued that spatial representations (maps and other visualizations) are often given greater weight in planning and policymaking than knowledge presented in other ways. They argue that quantitative data and scientific or expert knowledge compared to experiential community-based efforts has greater power and is more relevant. Elwood (2006) suggests that this is especially true in the area of spatial knowledge and cartographic representations that are produced using a GIS and other digital technologies. Art providers, organizations, and institutions can develop shared knowledge from analyzing data in cartographic form and then use this knowledge as the basis for developing a coordinated, strategic agenda with clear objectives and a plan of action. In order to reach this goal, data collection processes often need to be improved and upgrades made to parallel current and future technical capacities. In the current project, partner data was not collected with an eye towards its use in a spatial database and the consistency of data gathering was unclear. Program leaders, staff, artists and researchers would benefit by having a conversation about data that will support decision-making in new and innovative ways. Often, modest changes can be implemented right away including standardized visitor logs, but more creative opportunities should also be explored.

Adopting a MapGIS model in order to measure impact and promote knowledge production requires strategic planning and the input of ideas from all members of the art community in order to be effective. We tentatively offer the following ideas, list of justifications and possible challenges as a means of exploring new spatial data tools and technologies for making GIS more responsive and useful to the arts community.

Invest in GIS University-Community Partnerships

- a. Easy access to GIS expertise and existing data.
- b. Likely supports the “community outreach and support” mission of the institution.
- c. Cost to community partner is low; university may have limited capacity.
- d. Provides faculty and student researchers with community-based research opportunities; university or research agenda may not fit the project.
- e. University help/support may not align with community needs (semester schedule; summer availability).
- f. Analysis is limited to public data sets unless community organizations provide their own data.

Develop a Voluntary Geographic Information (VGI) Initiative. One of the vexing problems in social science research is how to combine quantitative and qualitative data together for effective analysis and decision-making. One promising avenue combines new interactive web-based technologies and user-generated content. Volunteered Geographic Information or VGI represents a new change in how information is created and shared. VGI refers to the conscious volunteering by individuals or groups to share spatial data. The social practice of VGI is relatively new and the research community is still at odds about the appropriate methods for synthesizing and using these as a new form of information. Elwood, Goodchild, and Sui (2012) provide an excellent overview of VGI and the emerging social and policy concerns related to this new form of information.

Opportunities for arts organizations and institutions to share and utilize data with VGI (Adapted from Kerski's, *Ways to Map Your Field Data*, 2014):

1. Sharing local organizational files with data that has some type of geographic component that can be mapped (i.e., spatial data like a street address, zip code, state, county).
2. Create new data from online forms, for example a Google form that periodically updates in a semi-automated way and then produces an updated map.
3. Create smart phone applications or applications for other mobile devices for data collection (video, geo-tagged photos) that can be uploaded.
4. Create a local geospatial art community data set and upload the data to ArcGIS Online and publish the data in the GIS cloud.
5. Initiate a collaborative art community mapping project by running a collector application on a smart phone:
 - a. The art organization can predefine the data attributes.
 - b. Allows for the creation of a drop down menu for a specific research project.
 - c. Potential to have a legion of volunteers collecting data (also known as crowdsourcing) on art activities and the impact are the arts.
 - d. For more detail and an example visit:
<http://blogs.esri.com/esri/gisedcom/2014/07/11/7-ways-to-map-your-field-data/>

Develop a regional/local GIS art center initiative whose mission is the production of spatial narratives based on public data, data collected from regional art organizations and institutions, and geographic information from volunteers (VGI). The initiative should involve more than simply creating maps of locations and organizational activities, but rather produce effective, flexible, and fast spatial information (maps, graphs, narrative) from digital information technologies like GIS. Digital technologies like GIS enable a user to try out different visualizations relatively easily and quickly, an invaluable capability for overtaxed community development institutions and staff members. Another important

consideration is the greater weight sometimes given to GIS-based representations of social and economic data or the greater expertise sometimes assumed of the individuals and organizations producing these representations.

Rationale:

1. Avoids duplication of effort in utilizing spatial data in the arts community.
2. Promotes collaboration among stakeholders, including problem-solving.
3. Establishes partnerships with GIS analysts and researchers to develop data-gathering methods and reporting.
4. Works with staff to highlight the need for accurate data and data-gathering practices.
5. Responsive to needs of the arts community by storing, retrieving, updating and analyzing information.
6. Creates effective, flexible and fast visualizations, for example:
 - a. A map showing distribution of art centers, organizations, school programs might be presented through a needs narrative in order to identify new sites of arts programming.
 - b. A set of comparative maps that seek to demonstrate uneven development of the arts, as well as uneven distributions of resources to support art programming. Such “injustice narratives” often parallel broader inequities experienced by a neighborhood or region and its residents.
 - c. Cartographic visualizations to demonstrate the successful development and implementation of arts outreach or investment in programming, in order to show improved conditions linked to these activities. These “accomplishment narratives” are most commonly directed toward local government institutions and funding agencies to garner further support.

Methodology/Technical Notes

The project employed both quantitative and qualitative analyses to address the project research questions. Spatial and statistical analysis of the datasets was conducted using a geographic information system (GIS). A GIS is a combined computer software and hardware system that allows users to capture, store, analyze, and manage spatially referenced data. For this project, data from the Census Bureau and American Community Survey (ACS) provided the first level of data analysis. Additional information from the General Social Survey and the Cultural Data Project was also assessed for possible inclusion in a GIS. Three project partners, including the Modesto Art Museum, the Carnegie Arts Center and the University School of the Arts were project partners. Each project partner committed to sharing data relevant to local art participation which became a central focus of data gathering and cartographic representation.

A wide variety of data can be used in a GIS. Often, this data requires some processing or manipulation before it can be used for analysis or to make a map. There is an abundance of free data available online from sources such as the USGS, the US Census Bureau, local governmental

agencies and many other sources. The primary GIS software used for this analysis is ESRI's ArcGIS which has been the industry standard for many years. A free 60 day trial is available at <http://www.esri.com/software/arcgis/arcgis-for-desktop/free-trial>

ArcGIS is a comprehensive GIS package which allows the user to make complex analyses and produce attractive maps. It is a complicated program and some GIS training is needed to produce cartographic visualizations and performing spatial analysis. There are also some open source GIS products available which are generally free of charge and can provide much of the functionality of ArcGIS. The most popular is called Q-GIS. Their website is: <http://www.qgis.org/en/site/>

We utilized the Hot Spot Analysis tool in ArcGIS in order to produce some of the maps. The tool calculates the Getis-Ord G_i^* statistic for each feature in a weighted set of features. The G_i^* statistic tells you whether features with high values or features with low values tend to cluster in a study area. This tool works by looking at each feature within the context of neighboring features. If a feature's value is high, and the values for all of its neighboring features are also high, it is a part of a hot spot. The local sum for a feature and its neighbors is compared proportionally to the sum of all features; when the local sum is much different than the expected local sum, and that difference is too large to be the result of random chance, a statistically significant Z score is the result

Additional Resources

Link to MapGIS Powerpoint (project summary, visualizations, etc.) - <http://geoimages.csustan.edu/NEAIndex.html>

California Department of Education – Downloadable Data File - <http://www.cde.ca.gov/ds/dd/>

How to use the Collector for ArcGIS App to collect data in the field with a smartphone in order to produce an online map: <http://blogs.esri.com/esri/gisedcom/2014/07/11/7-ways-to-map-your-field-data/>

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