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Use of Geographic Information Systems by American Evaluation Association Members in their Professional Practice

Aaron W. Kates
Western Michigan University

Chris L. Coryn
Western Michigan University

Background: As geographic information systems (GIS) technology continues to develop and expand in its capacity and applications, it is becoming increasingly useful to many disciplines. Even so, little has been written about the place of GIS technology in evaluation practice, and there is a paucity of information as to the extent to and applications for which evaluation practitioners use such technology.

Purpose: In this investigation, the prevalence and common applications of GIS technology in professional evaluation practice are examined. Particularly, the study was designed to estimate what proportion of American Evaluation Association (AEA) members who self-identify as evaluation practitioners use GIS in their practice, if at all, and, if so, to what extent. For those who use GIS in their evaluation practice, the specific GIS software packages and applications used also are explored.

Setting: Not applicable.

Intervention: Not applicable.

Research Design: A simple random sample of American Evaluation Association (AEA) members were surveyed, with an emphasis on evaluation practitioners.

Findings: Less than less than half (41.04% ±6.09%) of AEA members who consider themselves evaluation practitioners have ever used GIS in their evaluation practice and less than one-third (31.47% ±5.75%) have received some form of training in GIS methods. Data visualization is, by far, the most frequent application of GIS in evaluation practice.

Keywords: *American Evaluation Association; geographic information systems; technology in evaluation; evaluation practice; research on evaluation*

Background and Introduction

Geographic Information Systems (GIS) are any computerized system that is used to store, manipulate, and analyze relationships between features and objects in space. While the body of knowledge upon which this technology is founded is highly specialized and complex, tools and technologies built from GIS systems are now ubiquitous, and often unnoticed, in daily life. From using Google Maps to locate a quick route to a nearby gas station to calculating a shipping charge for an online product order, many interact regularly with this type of technology.

Long before these more common everyday applications, GIS was used primarily for research purposes, beginning with Tomlinson (1967) who pioneered the first geodatabases to store natural resource data. Since the first documented application by Tomlinson, three primary uses for handling spatial data with GIS have emerged. These include (1) "to explore and visualize [spatial] data," (2) "to create and calibrate the models of the process generating the data," and (3) "to test hypotheses related to the processes generating the data" (Brunsdon & Comber 2015, p. 173). The possibility of applying these three functions to problems in a multitude of fields of inquiry has led to the expansion and adoption of GIS technologies across many disciplines including epidemiology, public health, policy making, criminal justice, and many more (de Smith, Goodchild, & Longley, 2018). Langabeer, Gourishankar, Chambers, Giri, Madu, and Champagne-Langabeer (2019), for instance, recently used GIS to model opioid treatment programs relative to population density and opioid overdose death incidence at the state and national level to estimate treatment capacity and need.

Azzam (2013), Azzam and Robinson (2013), and Renger, Cimetta, Pettygrove, and Rogan (2002) discuss numerous potential applications of GIS in evaluation practice, specifically. These articles provide out a rationale for using GIS to evaluate social service interventions. Azzam and Robinson (2013) assert that GIS

> …offers evaluators an effective method to explore how a program is situated within, and interacts with, its environment. A GIS analysis can reveal that a program located closer to public transit hubs serves more people, or that a program is attracting clients from certain neighborhoods and not others, or that intended program outcomes (e.g., decreased smoking) are occurring in certain neighborhoods but not others. This knowledge provides a more holistic view of programs, their settings, and how they influence each other (p. 208).

Azzam (2013) emphasizes the power of GIS visualizations to assist in recognizing "patterns of interaction between…data…and community characteristics" that may lead to findings regarding inequities that otherwise "may have been missed if the data were displayed in a table format or if simple charts were used instead of a GIS-generated map" (p. 72). Additionally, Azzam points to the use of GIS visualizations to "conduct needs assessments, track change over time, compare multiple variables, capture and document program implementation, and understand the factors that helped or hindered the achievement of program outcomes" (p. 72). Renger et al. (2002) focus on the importance of GIS for "depict[ing] change within a defined geographical area, regardless of the context" (p. 470), which they assert can be extremely important in assessing the efficacy of programs with spatial components such as neighborhood revitalization efforts.

Despite the inroads GIS technology has made in other fields, some have suggested that GIS has not been utilized to its full potential in the field of evaluation. Renger et al. (2002), for instance, remarked that

> Although the utility of GIS in such disciplines as geography, planning, epidemiology and public health is well documented…its usefulness as a tool for evaluators has gone relatively unnoticed…[and]…evaluators may have not recognized the potential of GIS (p. 469).

Jamieson and Azzam (2012) report that only 13% of their sample of American Evaluation Association (AEA) members have an interest in learning about geospatial technologies, such as GIS. Even so, there are no empirical studies of actual use of GIS in evaluation practice. In response to ongoing

and increasing appeals for research on evaluation, in particular research on evaluation practices (Coryn et al., 2016, 2017; Henry & Mark, 2003; Mark, 2008; Ozeki, Coryn, & Schröter, 2019; Stufflebeam & Coryn, 2014), the current investigation was designed and conducted with the intent to gather systematically-derived evidence of how and for what purposes GIS is, or is not, used by evaluation practitioners.

Study Objectives and Questions Investigated

In this investigation, the prevalence and common applications of GIS technology in professional evaluation practice are examined. Particularly, the study was designed to estimate what proportion of American Evaluation Association (AEA) members who self-identify as evaluation practitioners use GIS in their practice, if at all, and, if so, to what extent. For those who use GIS in their evaluation practice, the specific GIS software packages and applications used also are explored. The focal questions investigated were:

1. What proportion of AEA members who identify their primary professional identity as evaluator use GIS technology in their evaluation practice? Does use of GIS by AEA members who identify their primary professional identity as evaluator vary by their primary work setting?
2. What types of training in GIS have AEA members who identify their primary professional identity as evaluator received? Do types of training in GIS by AEA members who identify their primary professional identity as evaluator vary by their primary work setting?
3. How do AEA members who identify their primary professional identity as evaluator use GIS in their evaluation practice? Do uses of GIS in evaluation practice by AEA members who identify their primary professional identity as evaluator vary by their primary work setting?
4. What GIS software packages are most commonly used by AEA members who identify their primary professional identity as evaluator?
5. What do AEA members who identify their primary professional identity as evaluator perceive as barriers to implementing GIS in evaluation practice?

Method

Design

A cross-sectional design was used to investigate and address the focal research questions. More specifically, the design consisted of a simple random sample survey of AEA members, with an emphasis on those who identify their primary professional identity as evaluator. This particular subset of AEA members was selected for two reasons. First, Coryn et al. (2020) found that those AEA members who identify their primary professional identity as "evaluator" are more likely to respond to surveys of AEA members than those who identify another professional identity (e.g., instructor, student) as part of their membership application. Second, the focal questions are intentionally intended to investigate the evaluation practices of those who identify as professional evaluators, rather than those AEA members who may happen to do evaluation-related activities as part of their professional work (e.g., program managers, sponsors).

Sample

Following an application procedure and approval from the AEA Executive Board, the names and e-mail address of a simple random sample of n = 1,000 AEA member e-mail addresses was obtained.[1]

Of the n = 1,000 randomly selected AEA member e-mail addresses received, n = 5 members opted out prior to survey administration and n = 6 had undeliverable e-mail addresses, resulting in a final usable sample of n = 989. In total, n = 350 usable responses were obtained, resulting in a response rate of 35.39%. The response rate of 35.39% is well above the average of 25% typically obtained for surveys of AEA members (Coryn et al., 2020).

Shown in Table 1 are the traits/characteristics of the AEA membership overall and the obtained sample. Congruence between the overall AEA membership and the

randomly selected sample was ascertained from univariate z -tests of equality of proportions. Relative to the overall AEA member population, the sample slightly overrepresents female members, European American/White members, Latino/Hispanic members, and members who work primarily in nonprofit settings (see Table 1). In part, differences in self-reported ethnicity (in particular, overrepresentation of European American/White and Latino/Hispanic) are due to 22.03% of all AEA members providing "no response" when registering for membership versus only 2.00% for the simple random sample of members.

Table 1
Traits/Characteristics of
American Evaluation Association (AEA) Member Population and Obtained Sample

Trait/Characteristic[a]	AEA Member Population (N = 7,280), %[b]	AEA Member Sample (n = 350), %	Test of Equality, p[c]
Gender			
Male	24.05	20.57	0.16
Female	61.58	77.7	<0.01*
No Response	1.45	1.71	<0.01*
Ethnicity			
African American, Black	7.82	8.57	0.68
American Indian, Native American, Alaska Native	1.00	2.00	0.13
Asian	6.04	7.14	0.47
Caribbean Islander	0.66	1.14	0.46
European American, White	53.46	71.14	<0.01*
Latino or Hispanic	4.52	8.3	<0.01*
Middle Eastern or Arab	0.69	0.86	0.96
Native Hawaiian or Pacific Islander	0.30	0	0.60
Other	3.48	2.57	0.45
No Response	22.03	2.00	<0.01*
Primary Work Setting			
College/University	28.01	24.0	0.12
Federal Agency	5.25	6.00	0.62
Local Agency	2.05	2.86	0.40
Non-Profit Organization	21.02	27.71	<0.01*
Private Business	20.95	24.57	0.12
School System	2.05	2.00	1.00
State Agency	2.95	3.71	0.51

Trait/Characteristic[a]	AEA Member Population (N = 7,280), %[b]	AEA Member Sample (n = 350), %	Test of Equality, p[c]
Other	5.51	7.71	0.10
No Response	12.2	1.43	<0.01*

[a]Within subgroups, traits/characteristics percentages do not always total 100% due to item nonresponse/missingness and/or rounding error. [b]Population parameters from Coryn et al. (2019). [c]Statistical differences between AEA member population and obtained sample as derived from z-tests for equality of proportions ($p \leq .05$) are indicated by an asterisk (*).

Instrumentation

The survey questionnaire consisted of 35 items in total. Of the 35 items, 30 were closed-response (many of which were contained in small matrices grouped into similar items) and 5 were short, free-response items. The survey was intentionally brief (taking, on average, between 5 to10 minutes to complete) and designed only to elicit information pertinent to the investigation.[2] The first item of the questionnaire was a screening item ("Do you consider yourself to be a program evaluator as your primary professional identity?"). If a respondent indicated "no" to the screening question they were redirected using a skip pattern to a short set of demographic questions rather than specific questions regarding GIS in their evaluation practice. Of the n = 350 usable responses received (see "Sample," above), n = 251 respondents (71.71%) indicated their primary professional identity as evaluator and completed all items in the questionnaire. Given the nature of the items, the psychometric properties of the questionnaire were not estimated.

Procedures

The survey of AEA members was administered from April 3, 2019 (initial, pre-survey notification) to May 1, 2019 (survey closure) using the Qualtrics web-based survey system. An initial e-mail message inviting the selected sample and informing them of the study and its purposes was sent one week prior to administration of the survey questionnaire. Recruitment materials made no reference to GIS, but rather referenced technology use, so as to counteract any possible response or nonresponse bias based on participant interest. Reminder e-mails were delivered weekly over a three-week period thereafter to those who were selected for the sample but who had not yet responded. The survey was closed one week following the final e-mail reminder. In all correspondence, potential participants were informed that they would be entered into a lottery for an opportunity to win a US$500 Visa gift card upon completion of the survey questionnaire. Throughout the planning and execution of the survey, the principles of Dillman, Smyth, and Christian's (2014) tailored design method were applied with the intent of reducing coverage, sampling, nonresponse, and measurement errors. Specifically, empirically-demonstrated factors influencing response rates, such as tone and length of recruitment materials, use of an incentive, timing of reminder emails, and reducing fatigue through using skip patterns and making the survey as short as possible (Dillman et al., 2014), were attended to vigilantly.

Institutional Review. The study was reviewed and approved by Western Michigan University's Human Subjects Institutional Review Board. Prior to participating in the study, the selected sample of AEA members were asked to read an electronic informed consent.[3]

Data Processing and Analysis

Closed-response data obtained through the web-based survey were downloaded as tab-delimited files for processing and analysis.

Where relevant, bounds on errors of estimation, *B*, (notated by ± [i.e., sampling error]) for statistical estimates of population parameters were calculated. Free-response items were inductively coded to identify major themes and patterns.

Findings

Knowledge and Application of GIS

Of those AEA members who indicated their primary professional identity as evaluator (n = 251; as noted under "Sample" and "Instrumentation," previously, those who did not identify their primary professional identity as evaluator only completed questions regarding their demographic characteristics and are not, therefore, included in any analyses), 91.63% ±3.50% indicated that they know what GIS is. Of all self-identified evaluators, less than half (41.04% ±6.09%) reported having ever used GIS in their evaluation practice, whether or not they themselves performed such work. A much smaller proportion of self-identified evaluators (15.94% ±4.53%) reported performing GIS work themselves in their evaluation practice, as opposed to another team member performing any GIS work. Similarly, only 17.93% ±4.75% of self-identified evaluators reported currently using GIS in their evaluation practice.

To examine the effect of work setting on "know about GIS," "ever used GIS in evaluation practice," and "currently using GIS in evaluation practice" (each criterion was coded as 1 = yes and 0 = no), three logistic regression models were fit to the data. For the models, each of the primary work settings selected when registering for AEA membership were dummy-coded using College/University as the referent.

Although the odds ratios (OR) associated with many of the primary work setting predictors are large in magnitude, they are also imprecise as reflected by wide 95% confidence intervals (CI), as shown in Table 2. Additionally, model fit was poor for all three models as suggested by omnibus X^2 tests of model fit as well as Cox & Snell R^2 and Nagelkerke R^2. The wide CIs associated with the point estimates of the ORs and poor model fit are, in part, due to the small sample size as well as large standard errors (SE; not shown in Table 2). Despite poor model fit, it is notable that those AEA members who self-identify their primary professional identity as evaluator and who also work in school systems, state agencies, and federal agencies have a low probability of knowing what GIS is (OR = 0.15, OR = 0.39, and OR = 0.46, respectively). Likewise, those working in federal agencies also have a low probability of ever having used GIS in their evaluation practice (OR = 0.53) as do those working in school systems (OR = 0.66). Those working in federal agencies also have a much lower relative probability of currently using GIS in their evaluation practice (OR = 0.48).

Table 2
Predictors of GIS Knowledge and Use

	Model 1[a] (Know What GIS Is)					Model 2[a] (Ever Used GIS in Practice)					Model 3[a] (Currently Use GIS in Practice)				
Predictor[b]	Wald's X^2	*df*	*p*[b]	OR	95% CI (LL, UL)	Wald's X^2	*df*	*p*[b]	OR	95% CI (LL, UL)	Wald's X^2	*df*	*p*[b]	OR	95% CI (LL, UL)
Constant	24.56	1	<0.01*	10.20		0.96	1	0.33	0.76		0.72	1	0.40	0.69	
Federal Agency	0.98	1	0.32	0.46	0.10, 2.15	0.95	1	0.33	0.53	0.15, 1.91	0.35	1	0.55	0.48	0.04, 5.40
Local Agency	—	1	—	—	—	1.01	1	0.32	2.20	0.47, 10.20	2.14	1	0.14	5.78	0.55, 60.61
Non-Profit Organization	0.15	1	0.70	1.29	0.36, 4.71	0.17	1	0.68	0.86	0.41, 1.80	0.20	1	0.65	0.77	0.24, 2.47
Other	—	1	—	—	—	0.02	1	0.89	1.08	0.38, 3.05	0.03	1	0.86	1.16	0.24, 5.53
Private Business	0.31	1	0.58	1.47	0.38, 5.77	0.80	1	0.37	1.41	0.67, 2.99	0.10	1	0.76	1.19	0.39, 3.59
School System	3.49	1	0.06	0.15	0.02, 1.10	0.11	1	0.74	0.66	0.06, 7.44	—	1	—	—	—
State Agency	1.04	1	0.31	0.39	0.07, 2.38	1.01	1	0.32	2.20	0.47, 10.20	0.59	1	0.44	2.17	0.30, 15.71
Model Fit	X^2	*df*	*p*	R^2		X^2	*df*	*p*	R^2		X^2	*df*	*p*	R^2	
Omnibus Test of Model Fit	12.03	7	0.10			5.72	7	0.57			6.55	7	0.48		
Cox & Snell R^2				0.05					0.03					0.06	
Nagelkerke R^2				0.11					0.03					0.08	

[a]To conserve space and simplify presentation, β and SE β estimates are not presented; statistically significant coefficients ($p \leq .05$) are indicated by an asterisk (*). [b]Estimates of coefficients denoted with an em dash (—) could not be validly fit by model.

Training in GIS

Nearly one-third (31.47% ±5.75%) of all AEA members who self-identify their primary professional identity as evaluator (n = 251) have received some form of training in GIS methods. Of those who responded to the items regarding training (n =230), seminars (33.06%), college/technical (25.62%), and independent study (22.31%) are the most common forms of GIS training (see Figure 1).

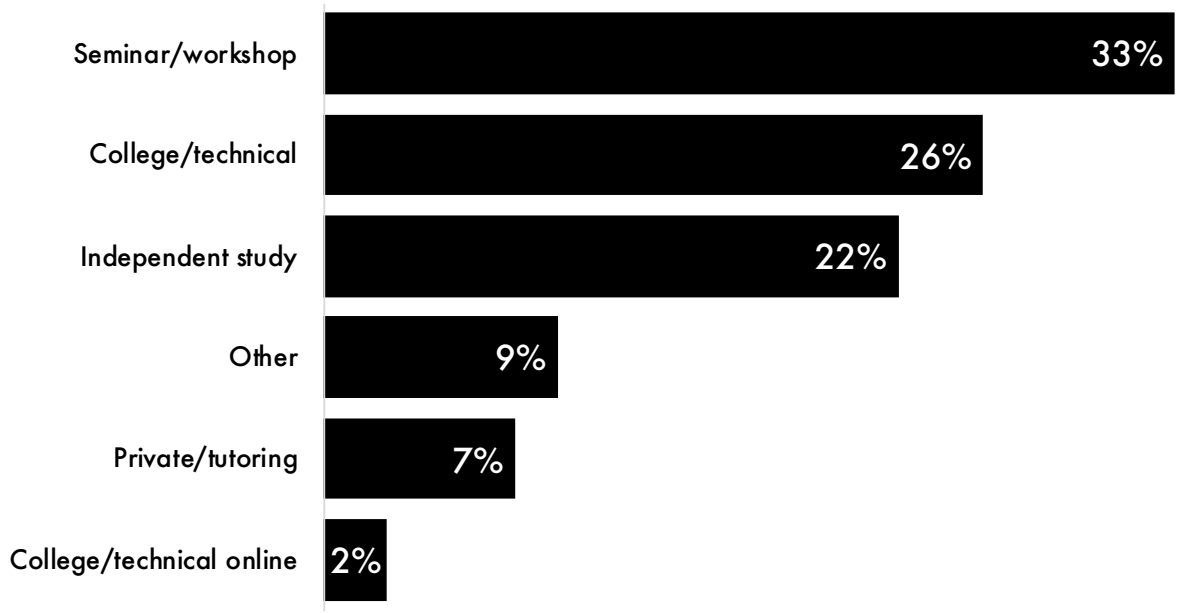

Figure 1. *Types of training in GIS.*

Under "other" in Figure 1, the majority of responses reflect minor variations on one or more of the predetermined response options provided. Of these, many could be considered on-the-job training or self-study (e.g., "YouTube," "online tutorials"). Others, however, reflect very specific situations (e.g., "K-12 teacher GIS education training. Including evaluating the use in K-12 setting.").

As shown in Table 3, those AEA members who self-identify their primary professional identity as evaluator and whose primary work setting is a college or university tend to receive training in seminars/workshops (15.28%), those in federal agencies tend to study GIS independently (5.65%), those in local agencies learn through seminars/workshops (2.78%), those in non-profit organizations use seminars/workshops (16.67%), those in private businesses learn GIS in college/technical courses (15.49%) and those in state agencies learn GIS equally through college/technical courses and through independent study (1.41%, respectively).

Table 3
Training in GIS by Primary Work Setting

Primary Work Setting	Type of Training[a]					
	College/ Technical, %	College/Technical Online, %	Private/ Tutoring, %	Independent Study, %	Seminar/ Workshop, %	Other, %
College/University	11.27	0.00	4.29	9.86	15.28	2.86
Federal Agency	4.23	1.45	0.00	5.63	4.17	1.43
Local Agency	0.00	0.00	1.43	1.41	2.78	0.00
Non-Profit Organization	8.45	1.45	4.29	9.86	16.67	4.29
Other	2.82	0.00	0.00	1.41	2.78	2.86
Private Business	15.49	1.45	2.86	8.45	11.11	4.29
School System	0.00	0.00	0.00	0.00	0.00	0.00
State Agency	1.41	0.00	0.00	1.41	1.39	0.00

[a]Percentages are not mutually exclusive (respondents could select more than one type of training) and do not necessarily total 100%.

Uses of GIS in Evaluation Practice

Shown in Figure 2 are the most common purposes for which those AEA members who identify as evaluators use GIS in their evaluation work. These percentages are calculated from those who responded to the items regarding specific uses (n = 103). By far, data visualization (85.44%) is the most frequently occurring application of GIS in evaluation practice, followed by spatial analysis (50.49%). "Other" uses (3.88%) of GIS by evaluation practitioners include "[using GIS for]…program planning and prioritization for funding opportunities," "[as an]…indicator of success in a vector management program capacity building program that we are currently evaluating," "[for]…proposal development", and "[for]…observation and embedded evaluation on how workshop participants apply GIS in their final projects."

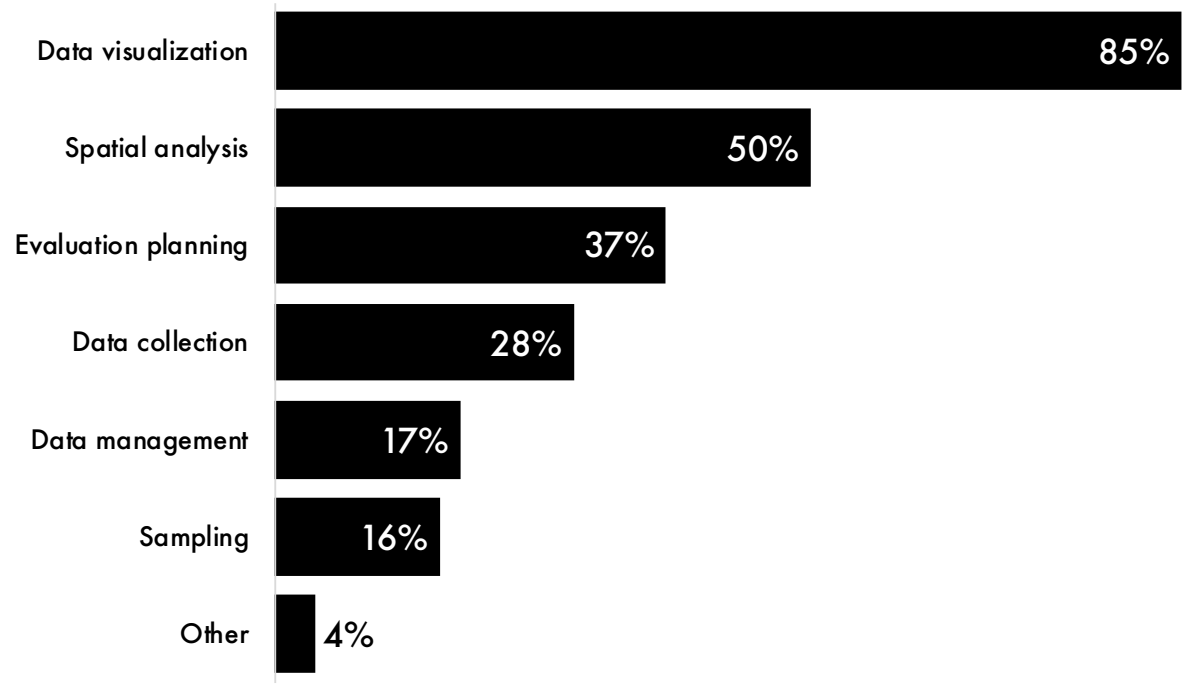

Figure 2. *Uses of GIS in evaluation practice.*

As shown in Table 4, those AEA members who self-identify their primary professional identity as evaluator, and no matter their primary work setting, use GIS most often for data visualization; in particular, those who work in private businesses, non-profit organizations, and colleges/universities (26.73%, 19.80%, and 18.81%, respectively). Spatial analysis is, notably, most often used by those working in private businesses (20.22%) and non-profit organizations (14.61%).

Table 4
Use of GIS by Primary Work Setting

Primary Work Setting	Use of GIS[a]						
	Data Collection, %	Data Management, %	Data Visualization, %	Evaluation Planning, %	Sampling, %	Spatial Analysis, %	Other, %
College/University	5.32	5.49	18.81	9.57	3.30	7.87	1.27
Federal Agency	0.00	1.10	3.96	2.13	1.10	3.37	0.00
Local Agency	1.06	1.10	2.97	2.13	0.00	2.25	0.00
Non-Profit Organization	8.51	5.49	19.80	9.57	6.59	14.61	1.27
Other	5.32	1.10	7.92	5.32	4.40	5.62	0.00
Private Business	7.45	3.30	26.73	9.57	2.20	20.22	1.27
School System	0.00	0.00	0.99	0.00	0.00	0.00	0.00
State Agency	2.13	1.10	4.95	1.06	0.00	3.37	1.27

[a]Percentages are not mutually exclusive (respondents could select more than one type of use) and do not necessarily total 100%.

Potential benefits of using GIS in evaluation practice, as enumerated by AEA members who self-identify their primary professional identity as evaluator, are shown in Table 5. Parallel to the findings illustrated in Figure 2 above, data visualization (62.96%) is, by far, considered the greatest benefit of integrating GIS into evaluation practice. The next most frequent themes were assessing reach/coverage (18.52%), spatial analysis (18.52%), understanding context (14.81%), and understanding basic spatial relationships (13.58%).

Table 5
Benefits of GIS in Evaluation Practice

Theme	%	Exemplar
Aiding visualization	62.96%	"It's a good visualization tool, but for many of my clients anything beyond that is too much."
Assessing reach/coverage	18.52%	"We are a local funder so it helps us to see that the program participants reside in the county that the taxpayers support."
Spatial analysis	18.52%	"…show correlations as well as statistically significant differences (based on geostatistic analysis—advanced application)."
Understanding context	14.81%	"GIS can reveal specific areas that are experiencing a greater level of something (poverty, a health issue, crime). GIS can reveal problems with things like food, school, health care, access."
Understanding basic spatial relationships	13.58%	"Being able to map locations, intensity, and do overlays."
Sampling	11.11%	"We can have a cartography for sampling sites to visit for data collection."
Data collection	6.17%	"…passive data collection that does not increase data collection burden."
Limited benefits	6.17%	"I'm not sure there are any."
Evaluation planning	3.70%	"…a nice complementary tool for planning."
Data management	3.70%	"…data organization."
Other	2.47%	"…provide new insights into logic models or theories of change."

GIS Software Used in Evaluation Practice

Shown in Figure 3 are the common GIS software platforms used by members of AEA who identify as being evaluation practitioners. The most common software platforms used are Tableau and ArcGIS (35.00% and 32.50%, respectively). "Other" GIS platforms used in evaluation practice include "Google," "Peg," "Mapline," and "Maptitude."

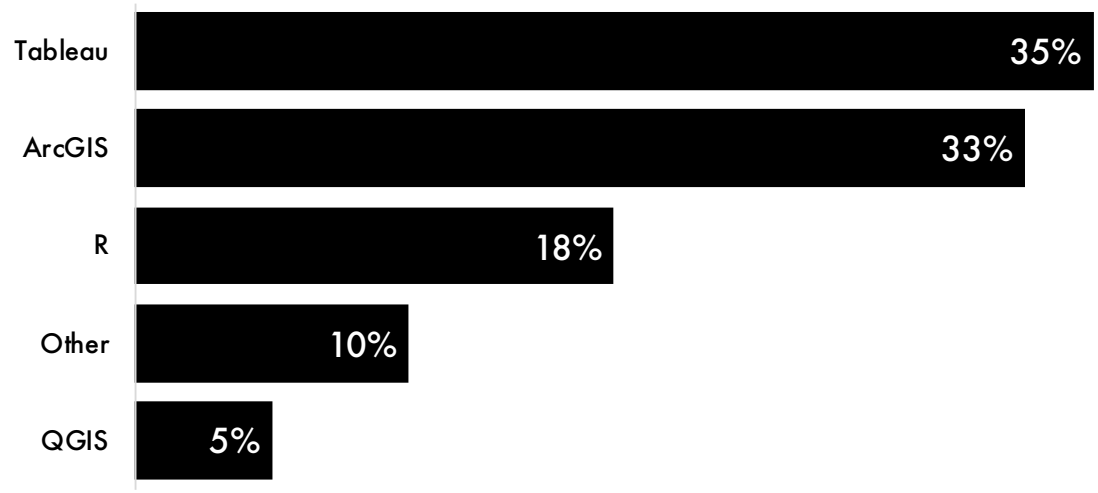

Figure 3. *Types of GIS software used in evaluation practice.*

Utility of GIS in Evaluation Practice

Overall, as shown in Figure 4, GIS is generally considered useful (73.21% ±5.80%; "useful" and "very useful," combined) by AEA members who identify themselves as practitioners of evaluation. Even so, and as illustrated in Figure 5, a majority simultaneously do not consider GIS completely necessary (68.16% ±6.11%; "not at all necessary" and "somewhat necessary," combined).

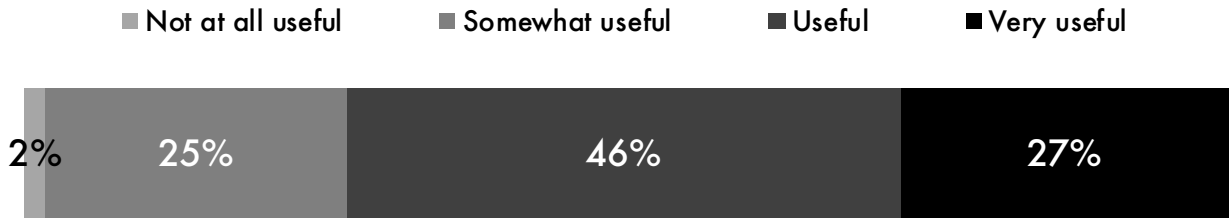

Figure 4. *Utility of GIS in evaluation practice.*

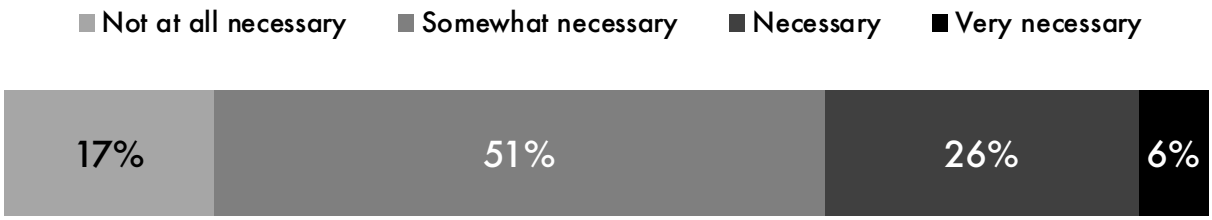

Figure 5. Necessity of GIS in evaluation practice.

Integration of GIS in Evaluation Practice

As shown in Figure 6, members of AEA who identify as being evaluation practitioners are nearly equally divided in their perceptions regarding the ease, or lack thereof, of integrating GIS into their evaluation practice (56.86% ±9.61%; "somewhat easy" and "very easy," combined).

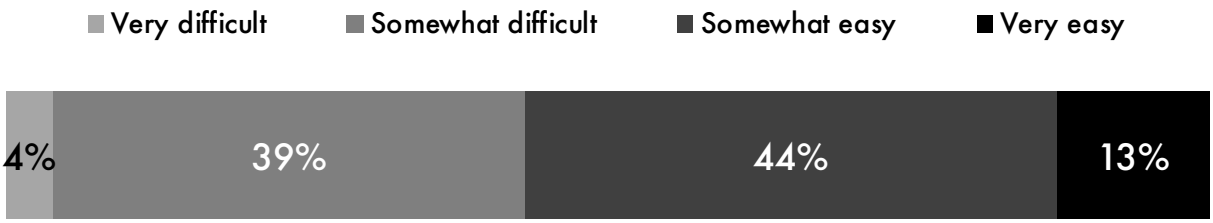

Figure 6. *Ease of integrating GIS into evaluation practice.*

As shown in Table 6, AEA members most commonly struggle with a lack of capacity (74.07%) to conduct or apply GIS in their practice. Specifically cited under the auspices of capacity was a lack of GIS training, difficulty of learning GIS software packages, time needed to become familiar and integrate GIS into their work, challenges associated with collaborating with those who possess appropriate GIS expertise, and lack of knowledge about the capabilities and potential applications of GIS. In addition, more than one-third (35.80%) of respondents referenced the high cost associated with many GIS packages as a barrier to entry (35.80%); although, several did mention free or low-cost alternatives such as QGIS. Availability and validity of data appropriate for GIS analyses was also noted as a barrier to integrating GIS in practice by more than one-fourth of respondents (25.93%).

Table 6
Barriers to Integrating GIS in Evaluation Practice

Theme	%	Exemplar
Capacity[a]	74.07%	
Training needs	22.22%	"Needs some skill/training to do. Not all evaluators are trained in GIS software."
Learning curve/unintuitive	16.05%	"Software is typically not user friendly."
Time constraints	13.58%	"It can be time consuming especially if you are new to it."
Need for collaboration	12.35%	"Requires working with someone who has those skills."
Lack of knowledge of applications	9.88%	"Published articles about general use of GIS in evaluation have stressed only its visualization capabilities—strong and important but underplaying what GIS could do for evaluation work."
Cost	35.80%	"Gaining access to the best software is difficult and costly."
Data constraints	25.93%	"Need specific geographic data that is not always available."

Theme	%	Exemplar
Validity of conclusions	7.41%	"There can be erroneous conclusion when the wrong unit of sampling and analysis is used…"
Organizational barriers	3.70%	"I work at a nonprofit whose leadership is, at times, almost willfully-ignorant of technology."
Relevance	3.70%	"…GIS may not be particularly relevant in many contexts."
Other	7.41%	"Evaluation is not a technical endeavor and the use of technology (or tools) is often overemphasized and overvalued by the evaluators, commissioners, and governments."

[a]Subthemes of the "capacity needs" theme total 100%.

Discussion

This study reveals some complicated dynamics in the use of GIS among AEA members who self-identify as primarily evaluators. As Jamieson and Azzam (2012) found that only 13% of AEA members were interested in GIS technology and, therefore, there was empirical evidence to expect a low rate of use among practicing evaluators. Indeed, the results presented in this study reveal low rates of current use (17.93%). Surprisingly, however, this rate was far outstripped by those who report having ever used GIS (41.04%) and those who have ever received any sort of training in the method (31.47%). While rates of current use and rates of doing one's own work in evaluation practice are low, relatively high rates of training and opinions regarding the utility of GIS suggest room for expansion of GIS use in evaluation. The findings of the subgroup analyses in this study also suggest that the settings most ripe for expansion of knowledge and use of GIS may be in school, federal, and state settings.

That the dominant training modality received is that of professional development seminars reveals that practitioners may lack the in-depth training that could be gained from such opportunities as a college course. Also, given that data visualization is by far the dominant use reported, both in quantitative and qualitative findings, it seems that many evaluators are not unlocking the capabilities of GIS for such purposes as spatial analysis or sampling, which could be of high utility. The fact that Tableau is the top GIS software for evaluators is also congruent with this finding, as it has limited spatial analysis capabilities when compared to other software such as R, ArcGIS, or QGIS.

The qualitative findings regarding the barriers to use of GIS reveal some interesting patterns. First, the fact that both top softwares are paid is congruent with the finding that cost is regarded as a major barrier to entry. The low use rates for R and QGIS could suggest at a lack of awareness at the availability of powerful open-source software. However, lack of capacity being a major barrier to many evaluators also explains their desire to use a paid software such as Tableau, as it is relatively user-friendly.

Implications

Theses findings suggest opportunities for continued development of GIS skills and knowledge among evaluators, most notably those in state, federal, and school settings. As noted previously, Azzam and Robinson (2013), Azzam (2013), and Renger et al. (2002) all point to significant methodological advantages that could be afforded the evaluation community if put to full use. This paper provides evidence not only of the existence of gaps in use, but also to a general misunderstanding of the technology as a potential reason for this. For example, there is a marked lack of knowledge as to the potential applications of GIS in evaluation as evidenced by the overwhelming focus on using GIS for data visualization. While it may not be necessary for all evaluation practitioners to

possess proficiency in GIS, it could be very helpful for evaluators to have a more in-depth understanding of how such powerful tools as spatial analysis could be leveraged toward solving evaluative problems.

Limitations

As a cross-sectional investigation of AEA members, inference is limited to that population, in general, and to those who self-identify their primary professional identity as evaluator, specifically. Any inferences to the broader community of evaluators, within and without AEA is, therefore, unwarranted.

Although the study was designed to investigate GIS use among AEA members whose primary professional identify is evaluator, the simple random sample of members provided by AEA included those who self-report other professional identities in their membership profiles (e.g., consulting, management/administration, teaching). Additionally, the omission of first names from the provided sample made the task of personalization of communications, which has been demonstrated to increase response rates (Dillman et al., 2014), more difficult.

Lastly, while subgroup analysis was possible with the data from this study, a great sample size would be needed to further confirm any of the patterns found therein.

Future Research

This work represents the first study of its kind focused specifically on GIS use in evaluation practice. Beyond these exploratory findings, little is known about the state of the field in terms of evaluators' use of GIS. Further research could deepen the work begun here. For instance, while these findings suggest some differences in use of GIS between professional evaluation settings, stronger evidence would need to be uncovered to confirm or deny the veracity of these patterns. Additionally, this research raises questions regarding the quality of training that evaluators are receiving. A systematic review or cross-sectional study of GIS trainings could illuminate potential reasons for underuse of GIS in the evaluation field.

Notes

1. A simple random sample estimated using a bound on the error of estimation, B, of $\pm$ 5% and a conservative population proportion of p =.50 (i.e., 50%) of the $N \sim$ 3,082 AEA members who self-report their primary professional identity as "evaluator" as part of their membership application (42.28% of the total AEA member population according to Coryn et al. [2020]) produced a necessary sample size of n = 354 to address the focal research question. However, AEA selected and provided a simple random sample of n = 1,000 members, despite the above estimate provided at the time of the research application.
2. The complete survey questionnaire is available from the first author upon request.
3. In addition to requesting informed consent, participants also received the following information in the initial and subsequent e-mail notifications: "You are receiving this e-mail as a member of the American Evaluation Association (AEA). This research request was reviewed by a Research Request Task Force consisting of tenured AEA members. If you have concerns about the survey and would like to express them to the AEA leadership, please e-mail info@eval.org. Any concerns raised will be shared, confidentially, with the Executive Committee of the association. AEA allows its membership list to be used infrequently for research that focuses on the field of evaluation. If you would like to opt out of AEA's research list, please send an email request to info@eval.org. Please note that we encourage you to consider remaining on the list as such research strengthens and furthers the field's knowledge base."

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