Geography Deserts: State and Regional Variation in the Formal Opportunity to Learn Geography in the United States, 2005–2015

Mark C. Jones and Marcos Luna

Abstract

The formal opportunity to learn geography in the United States is unevenly distributed across space, creating possible geography deserts. Data on the number of exams taken in Advanced Placement Human Geography (APHG) and bachelor's degrees earned in geography are mapped at the state and regional scales. Normalized rates are ranked and grouped into quintiles. For APHG exams, states in the southeastern region of the United States are in the uppermost quintiles while states in the northeastern region are in the lowermost quintiles. The pattern for bachelor's degrees in geography is somewhat the spatial inverse of that for APHG.

Key Words: *geography desert, Advanced Placement Human Geography, bachelor's degree, geography education, geography of education*

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Introduction

Formal opportunities to learn geography are distributed unevenly across the United States. Our analysis of available data shows that geography as a subject in secondary and postsecondary education has a minor presence in many states and even major regions of the country. This uneven educational landscape has a detrimental impact on society, as large numbers of people from vast areas of the country are less likely to have the chance to learn geography in formal educational settings. In turn, the lack of a geographic education may result in much of the public remaining ignorant of the spatial thinking that is geography's hallmark as a discipline (de Blij 2012). In addition to the negative consequences for society as a whole, geography as an academic subject and profession is weakened by the skewed spatial distribution of opportunities to study geography.

Hillman (2016) borrows from the familiar concept of food deserts and investigated what he terms "education deserts," where 4-year higher education institutions are not within a convenient commuting distance. Applying Hillman's idea of education deserts to the curriculum of secondary and postsecondary education institutions allows for a refinement of the concept. Even if there are multiple education institutions within commuting distance of any one place, it is possible that the absence of geography from the curriculum of those institutions has created a "geography desert."

The purpose of this article is to document and explore the uneven spatiality of formal opportunities to study geography in the United States. After a literature review, the article addresses data selection and methodology, and then presents and discusses the results. The conclusion includes several recommendations for the major geography organizations in the United States to consider as part of a spatial strategy in expanding geography instruction to areas where it is not currently widely available.

Literature Review

The geography of education examines the spatiality of educational institutions and student access to educational opportunities (Holloway and Jöns 2012; Brock 2013a). The literature on this topic dates back to the 1970s, demonstrating a long-standing awareness of spatial aspects to public policy on education (Hones and Ryba 1972; Andrews 1974). However, the literature is dominated by British cases (Brock 2013b; 2016) and often focuses on school choice at the primary and secondary levels (Butler and Hamnett 2007). Taylor (2009) provides a review of the field in an attempt to stimulate scholars in education and geography to conduct further research. He identifies research paths including the geography of educational establishments, and the spatial distribution of educational resources and opportunities.

Geographers have on occasion applied a spatial perspective to their own discipline, creating a small literature that might be termed "the geography of geography." Some of these studies have considered the early days of academic

geography in the United States, identifying original centers of geographic thought in doctoral granting departments (Koelsch 2001) or the circumstances surrounding particular departments within a region (Smith 1987; Martin 1998).

There are also a few decades-old studies that consider the overall spatial distribution of geography departments or from where academic geographers come. Dorschner and Marten (1990) created a series of maps showing the date of establishment of departments of geography in the United States. These maps show the major concentrations of departments and reveal states or regions with few departments. A map that plots the location of all geography departments existing in 1988 provides a sense of how uneven a pattern existed at that time. Fink (1979) considered where in the United States academic geographers live, finding high concentrations in the Northeast, Midwest, and Pacific Coast, and lower numbers in the Middle Atlantic and West South Central regions. Gerlach (1979) looked into where doctorates in geography were earned between 1972 and 1977 by state and region. The dominant source regions then were the Great Lakes states and the Pacific Coast. Janelle (1992) in a book chapter titled "The Peopling of American Geography" mapped Association of American Geographers (today American Association of Geographers or AAG) membership data for May 1989. One map shows the number of AAG members per 100,000 people by state of birth. The highest concentration was in the Great Lakes states plus North Dakota and Utah. Several states in the southeastern United States were the lowest. The second map shows the number of geographers per 100,000 people by state of current residence. High rates occurred in scattered states, including Maryland, Wisconsin, Minnesota, North Dakota, Colorado, and Oregon. A cluster of states in the south-central part of the United States had the lowest rate.

A handful of studies exist that consider where opportunities to study geography are located. Croot and Chalkley (1999) analyzed universities offering a geography degree in England and Wales. They determined from where each university drew their students, and where each county's students who selected geography as their field of study enrolled in universities. In the United States, Stoltman et al. (2005) identified research paths using the then relatively new Advanced Placement Human Geography (APHG) course created by the College Board. One of these paths specifically mentions the spatiality of where the course is offered. Gray, Hildebrant, and Strauss (2006) evaluated the first 5 years (2001–2005) of APHG. Their article mapped at the state scale the number of exams, the number of exams normalized by student population, and the number of exams per school for both 2001 and 2005. States in the Great Plains and Northeast generally had the lowest values for each of the three types of data for both years.

The Geography Education National Implementation Project (GENIP), a consortium of the four major geography organizations in the United States, issued two reports providing state-by-state analysis of geography's role in kindergarten through grade 12 (hereafter K–12) curricula (Moore 2004; Wdowiarz 2005). These reports include maps that show which states, for example, require a geography course to graduate from high school or include geography content in high school exit exams. The maps show that geography has just a minor presence in a large number of states' education requirements.

The most recent source that shows state requirements for geography in map form uses 2013 data (U.S. GAO 2015). Thirty states have no statewide geography requirement, including all six New England states and much of the Midwest and Great Plains. Eleven states require geography in middle school only, seven require it in both middle and high school, and two require geography in high school only. In some states, local school districts could choose to offer geography even if their state did not mandate it.

What is not found in the literature, at least in significant numbers and within the past few years, are publications that illustrate the spatiality of actual instruction in geography. While there are sources that mention the presence of geography in state public elementary and secondary school standards (Munroe and Smith 1998; Anthamatten 2004; Bailey and Dixon 2007; Brysch 2014; U.S. GAO 2015; GENIP 2017), there is a need for research on where students actually do have a significant learning experience in geography. The U.S. federal system decentralizes educational policy, making state and local government responsible for determining what courses are offered (Bednarz, Heffron, and Solem 2014). Thus, an analysis of the potential to study geography in the 50 states is needed. In the next section we describe our process for identifying formal opportunities to learn geography across the United States for high school and college students at state and regional scales.

Data Selection and Methodology

People can learn geography in a variety of informal and formal settings. The informal could be traveling with one's family on vacation, reading *National Geographic* magazine, picking a route for driving from one place to the next, or studying/living abroad. The formal learning experience is commonly enrollment in a course offered by an accredited educational institution.

For the purpose of this study we define a significant formal learning experience in geography as occurring when three conditions are met. First, the student completes one or more geography courses that use a current understanding of the discipline. Second, the instructor has sufficient professional experience (e.g., course work and degrees in geography, years of experience teaching geography, professional development in geography) to

offer a successful course. Third, the students are old enough to engage with sophisticated subject matter and ways of understanding it. Primary and secondary schools in grades K–12 offer a wide variety of courses that meet state and/or local school district curricular needs and requirements. In the United States geography is offered commonly in junior high school and less commonly in high school (Anthamatten 2004). Blended courses where geography is a part of the course content are also a possibility, such as a combined state history and geography course.

Identifying examples of significant formal learning experiences in geography is more difficult in elementary and secondary schools than in higher education. There is also the challenge of determining how many students in each of the 50 states took a course considered "geography" in any given year, in that there is no data source we know of that tracks national K–12 enrollment by subject, state, and year. The College Board's APHG course is intended to be the equivalent of an introductory college course in human geography and thus can be considered a significant formal learning experience in geography. Instructors must submit a syllabus for approval by the College Board that broadly follows the published course outline. A study of AP Biology and AP U.S. History teachers confirms the tendency of AP teachers to be experienced instructors with a graduate degree (Paek et al. 2005). In light of the difficulties already described in determining what counts as a significant learning experience in geography, and obtaining complete, reliable, uniform data for all 50 states on an annual basis, we chose APHG as the K–12 example of a significant formal learning experience.

Using the APHG course as a proxy measure of a significant formal secondary education learning experience in geography is advantageous in that the College Board website makes publicly available summary data including the number of exams taken (The College Board 2017). We extracted the total number of exams taken in APHG for each state for three years: 2005, 2010, and 2015.

Regarding APHG data, there are two details that should be recognized. First, the initial APHG exam was in 2001, so choosing 2005 as the first year of data means that these data may be more representative of typical patterns than if 2001 data were used. Second, while it is customary in schools for all students enrolled in an AP course to take the corresponding exam, this may not always happen for a variety of reasons. Thus, the numbers of exams taken might be less than the actual numbers of students who took the course. For recent assessments of APHG and its role in U.S. geography education, see Bednarz (2016) and Lanegran and Zeigler (2016).

At the postsecondary level, we selected the completion of a bachelor's degree in geography as evidence of a significant formal educational experience in geography. As a stand-alone subject, geography is not present in the curriculum at all comprehensive colleges and universities (Murphy 2007). One source reports that geography departments exist in only 11 percent of all 4-year higher education institutions in the United States, comprising 22.9 percent of public and 2.4 percent of private institutions (Adams, Solis, and McKendry 2014). If not recognized on campus as a separate discipline, geography courses may be part of interdisciplinary majors such as environmental science or urban and regional planning, or a regional studies major like Latin American studies.

We are not aware of a data source that gives numbers of students enrolled in geography courses or who complete a geography minor that could be aggregated to produce annual state totals. Therefore, we chose to use completion of a bachelor's degree comprising multiple courses as evidence of a significant formal educational experience in geography, instead of using enrollment in a single course as selected for the secondary level. To be clear, a "significant formal learning experience" does not represent a theoretically important milestone, but rather a measurable, formal event in geographic education where there is otherwise a lack of available data. We recognize APHG is not equivalent to a bachelor's degree in geography, but both serve as imperfect proxies to measure formal educational experiences in geography.

The AAG produces an annual guide to postsecondary programs in geography in the western hemisphere (e.g., AAG 2017). The entries for individual universities give annual information about the number of degrees granted and students in degree programs. However, the AAG guide is based on voluntary reporting by departments. Since departments must pay to have an entry, not all departments are listed. In addition, the data on degrees granted may not be current or might include nongeography degrees in the case of a hybrid department (e.g., geography and geology).

In light of the drawbacks in the data contained in the AAG guide to programs in geography, we used data on bachelor's degrees completed in geography from the National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS) (U.S. Department of Education 2017). Data on undergraduate and graduate degrees are available in broad fields, with geography included in the category of social sciences and history. We extracted data for undergraduate degrees in geography, cartography, and geographic information systems (GIS) from the larger category by using CIP Code 45.07. We selected the same academic years as with APHG to allow comparison between the two data sets: 2004–2005, 2009–2010, and 2014–2015. Data on degree completion from NCES's IPEDS is considered to be complete and reliable. Institutions that do not submit annual data are at risk of losing federal funds for financial aid. The response rate for institutions is thought to be above 99 percent, and

institutions can correct errors if any are discovered (D'Amico 2018).

Given the significant variation in the sizes of the populations of the 50 states, we normalized the exam and degree data using the number of students in grades 9–12 in each state for APHG exams, and the number of undergraduate students in each state for bachelor's degrees in geography. We took data on grades 9–12 and undergraduate enrollment from the respective years of the American Community Survey (U.S. Bureau of the Census 2017).

Maps of the distribution of some characteristics across the 50 states plus the District of Columbia can often be difficult to interpret. The sheer variety in the states due to their physical and human geography, as well as differing state and local policies on education, can result in a complex pattern that defies easy statements about trends. In order to make trends more easily recognizable, we mapped the two types of data (APHG exams and bachelor's degrees) at the regional as well as the state scale. The regional scheme is based on U.S. Census regions. The nine regions allow subnational differences to emerge but allow for easier recognition of broader trends than at the state scale. In addition, we grouped the normalized data for states and regions into quintiles to more easily recognize places where taking the APHG exam or completing a bachelor's degree in geography was more or less common. Last, we mapped the locations of universities offering a bachelor's degree in geography and overlaid this upon the maps of both APHG exams and degrees completed. The AAG supplied the data on departments known to grant bachelor's degrees in 2018 and immediately prior years. For reasons of space, the article includes only the 2015 data in table and map form.

Results and Discussion

Advanced Placement Human Geography Exams

Tables 1 and 2 show the numbers of APHG exams in 2015 by state and region. We also show for purposes of comparison the rate and rank of each area plus the net change in exams for the period 2005–2015. In many cases, the absolute numbers of exams taken are rather low. For example, in 2015 only six students took the APHG exam in Vermont (Table 1), and the six states of the New England region had only 1,564 students take the APHG exam (Table 2). Figures 1 and 2 reveal clusters of adjacent states or regions in the same quintile or in two consecutive quintiles. The map of APHG exams in 2015 at the state scale (Figure 1) shows the popularity of this course in the southeastern United States. With the notable exception of Alabama and Mississippi, there is an arc of

Table 1. AP Human Geography exams by state.

	2015			2005–2015		2015			2005–2015
State	Count	Rate	Rank	Change	State	Count	Rate	Rank	Change
AL	388	14.9	42	385	MT	32	6.5	49	31
AK	14	3.3	50	−2	NE	1,125	107.9	13	1,098
AZ	1,315	35.4	29	1,196	NV	1,075	68.5	22	994
AR	952	62.5	23	777	NH	97	14.2	44	59
CA	10,933	50.5	25	9,739	NJ	1,309	27.3	35	1,250
CO	4,583	163.9	7	3,524	NM	338	29.7	33	303
CT	607	30.4	32	431	NY	2,358	23.7	38	2,103
DE	189	39.8	28	189	NC	6,006	112.4	10	5,362
DC	225	91.4	16	201	ND	55	15.8	41	55
FL	33,217	337.3	1	30,318	OH	1,267	20.3	39	1,166
GA	9,668	165.2	6	8,772	OK	406	19.3	40	305
HI	82	12.5	45	81	OR	1,723	84.5	18	1,668
ID	232	24.6	36	177	PA	1,868	29.4	34	1,712
IL	7,029	101.0	15	6,356	RI	152	32.5	30	116
IN	1,920	52.6	24	1,819	SC	4,399	170.9	5	4,071
IA	1,313	81.6	19	1,187	SD	177	41.1	27	136
KS	390	23.9	37	389	TN	3,720	110.7	11	3,694
KY	3,961	172.3	4	3,806	TX	25,309	159.3	8	23,435
LA	2,699	110.2	12	2,596	UT	3,745	187.7	3	3,500
ME	204	31.3	31	137	VT	6	1.9	51	4
MD	2,752	88.7	17	2,534	VA	5,127	119.8	9	4,322
MA	498	14.7	43	449	WA	3,890	105.4	14	3,774
MI	584	10.9	47	489	WV	647	76.8	20	603
MN	6,068	205.9	2	5,697	WI	2,143	71.4	21	2,096
MS	146	8.8	48	144	WY	131	46.1	26	131
MO	377	11.9	46	324	USA	157,451	92.1		143,703

Note. Rates are per 10,000 enrolled students in that year.

Table 2. AP Human Geography exams by region.

Region	2015 Count	2015 Rate	2015 Rank	2005–2015 Change
East North Central	12,943	51.3	7	11,926
East South Central	8,215	82.8	5	8,029
Middle Atlantic	5,535	26.2	8	5,065
Mountain	11,451	88.6	3	9,856
New England	1,564	20.8	9	1,196
Pacific	16,642	58.5	6	15,260
South Atlantic	62,230	191.1	1	56,372
West North Central	9,505	85.0	4	8,886
West South Central	29,366	133.7	2	27,113
USA	157,451	92.1		143,703

Note. Rates are per 10,000 enrolled students in that year.

states from Maryland to Texas that lies within the top two quintiles. Colorado and Utah are another cluster in the top quintile, and Washington state and Oregon are in the second highest quintile. At the other end of the distribution, a band of states from Maine to Michigan with the exception of Rhode Island lies in the bottom two quintiles. At the region scale (Figure 2), much of the Northeast is in the lowest quintile for APHG exams and much of the Southeast is in the highest quintile.

Bachelor's Degrees in Geography

Tables 3 and 4 show the number of bachelor's degrees granted in 2015 by state and region. We also show the rate and rank for each area plus the net change in degrees granted for the period 2005–2015. Finally, we show the number of universities that grant a bachelor's degree in geography in each area. In 2015 only five students earned a bachelor's degree in geography in both Rhode Island and Alaska (Table 3). While these states have small populations, the number of geography degrees earned is low even when considering the small base population. The four states of the East South Central region (Kentucky, Tennessee, Alabama, and Mississippi) reported only 198 bachelor's degrees awarded in geography (Table 4).

The map of bachelor's degrees granted in 2015 at the state scale (Figure 3) shows a rough north–south split

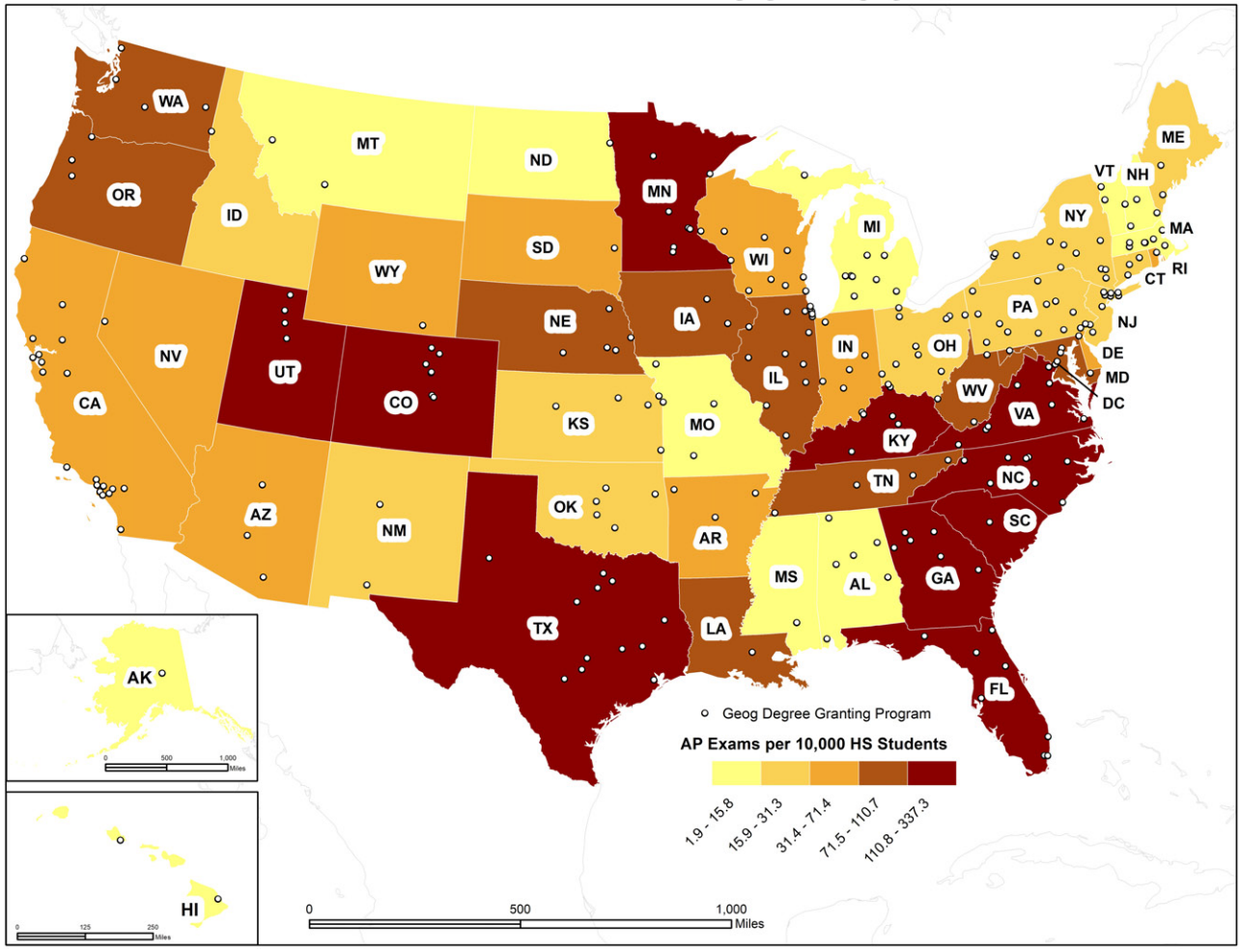

Figure 1. AP Human Geography exams by state. (Color figure available online.)

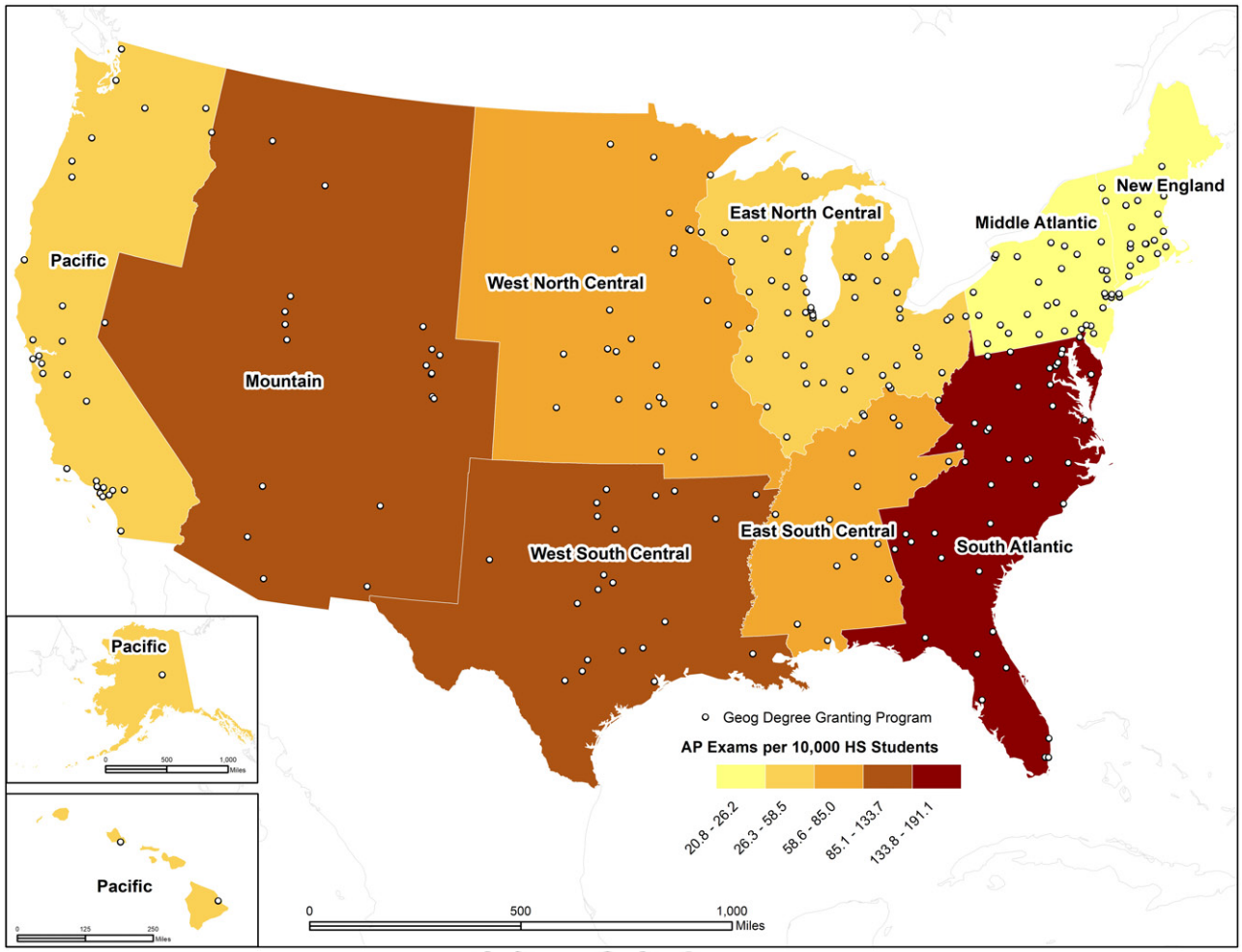

Figure 2. AP Human Geography exams by region. (Color figure available online.)

along a line that begins with the Virginia–North Carolina border and generally extends westward along the 36°30′N parallel to the Kansas-Oklahoma border. While there are obvious exceptions (e.g., Iowa in the bottom quintile and Alabama in the second highest quintile), states north of this line tend to be in the upper quintiles and states south of this line in the lower quintiles. Clusters that stand out include Vermont and New Hampshire, Minnesota and Wisconsin, and Utah and Colorado, all of which are in the top quintile. At the regional scale (Figure 4), the north–south split is still evident, though an east–west split is also suggested.

Interpreting the Pattern of APHG Exams and Bachelor's Degrees

The relative numbers of exams and degrees for individual states and regions are very uneven. Figures showing 2015 data reveal sharp contrasts in the rate at which students take APHG exams and earn bachelor's degrees in geography across the country. Lanegran and Zeigler (2016) explain the variation in numbers of APHG exams between states as a function of state policy, population size, and regional trends. By state policy, Lanegran and Zeigler mean state initiatives to have more students take AP courses.

We explain these imbalances as the combined result of several key factors that differ between states and/or school districts: (1) state curricula with some states supporting geography within social studies; (2) support among states and school districts for Advanced Placement courses; (3) majors offered at colleges and universities in each state; and (4) support offered by state geography alliances. First, the competition for a role within the K–12 social studies curriculum between history, on one hand, and several social science subjects including geography, on the other hand, tends to favor history in most states (Halvorsen 2013). Geography is generally a minor subject, with some states including a required course, available but optional courses, or content strands of geography within larger social studies frameworks (Munroe and Smith 1998; Anthamatten 2004;

Table 3. Bachelor's degrees in geography by state.

State	2015 Count	2015 Rate	2015 Rank	2005–2015 Change	2018 Geography programs	State	2015 Count	2015 Rate	2015 Rank	2005–2015 Change	2018 Geography programs
AL	83	3.2	15	16	6	MT	31	6.2	6	20	2
AK	5	1.2	40	2	1	NE	26	2.4	26	−20	5
AZ	104	2.7	19	35	3	NV	9	0.6	50	−6	1
AR	17	1.1	45	−6	3	NH	60	7.8	1	11	4
CA	601	2.2	28	130	20	NJ	60	1.3	39	20	4
CO	241	7.7	3	67	7	NM	29	2.4	27	11	2
CT	40	1.9	35	−1	3	NY	200	1.7	36	−19	15
DE	9	1.6	37	−6	1	NC	130	2.2	29	7	8
DC	13	2.5	24	0	1	ND	16	3.2	16	8	1
FL	228	2.0	33	85	8	OH	161	2.6	23	−12	11
GA	82	1.4	38	27	6	OK	56	2.6	21	9	5
HI	25	3.1	17	5	2	OR	81	3.7	14	−16	3
ID	9	1.0	47	4	1	PA	264	3.8	12	69	15
IL	143	2.0	34	0	15	RI	5	0.6	49	2	1
IN	97	2.6	22	44	6	SC	14	0.5	51	−12	1
IA	23	1.2	42	−33	2	SD	11	2.5	25	−2	1
KS	46	2.6	20	−7	4	TN	33	1.0	46	−25	4
KY	63	2.8	18	−11	5	TX	327	2.2	31	21	12
LA	25	1.1	44	3	1	UT	130	6.3	4	−35	4
ME	6	0.9	48	−1	2	VT	33	7.8	2	2	2
MD	187	5.0	7	46	5	VA	216	4.2	11	64	8
MA	99	2.2	30	−32	7	WA	158	4.2	10	−10	4
MI	73	1.2	41	−58	9	WV	40	4.6	8	7	3
MN	135	4.6	9	−23	8	WI	207	6.3	5	6	11
MS	19	1.1	43	11	1	WY	12	3.8	13	3	1
MO	71	2.1	32	−4	5	USA	4,753	2.6		396	260

Note. Rates are per 10,000 enrolled students in that year.

Table 4. Bachelor's degrees in geography by region.

Region	2015 Count	2015 Rate	2015 Rank	2005–2015 Change	2018 Geography programs
East North Central	681	2.6	4	−20	52
East South Central	198	2.0	8	−9	16
Middle Atlantic	524	2.2	7	70	34
Mountain	565	4.2	1	99	21
New England	243	2.6	3	−19	19
Pacific	870	2.6	5	111	30
South Atlantic	919	2.5	6	218	41
West North Central	328	2.8	2	−81	26
West South Central	425	2.0	9	27	21
USA	4,753	2.6		396	260

Note. Rates are per 10,000 enrolled students in that year.

Moore 2004; Wdowiarz 2005; Bailey and Dixon 2007; Brysch 2014; U.S. GAO 2015; GENIP 2017).

Second, should a state have a significant role for geography in the curriculum, it becomes easier for APHG to enter school district course offerings. For example, states including Florida or Texas that commonly offer a freshman or sophomore world geography course could permit the substitution of APHG. Substituting one geography course for another is easier than having to make the case for geography in the first place within a crowded curriculum. More broadly, some states may try to increase their offering of AP courses as a means of strengthening student preparation for postsecondary education or to reduce disparities in accessing AP courses by minority students.

Third, the availability of a geography major at universities within the state will likely influence the supply of teachers with sufficient preparation in geography

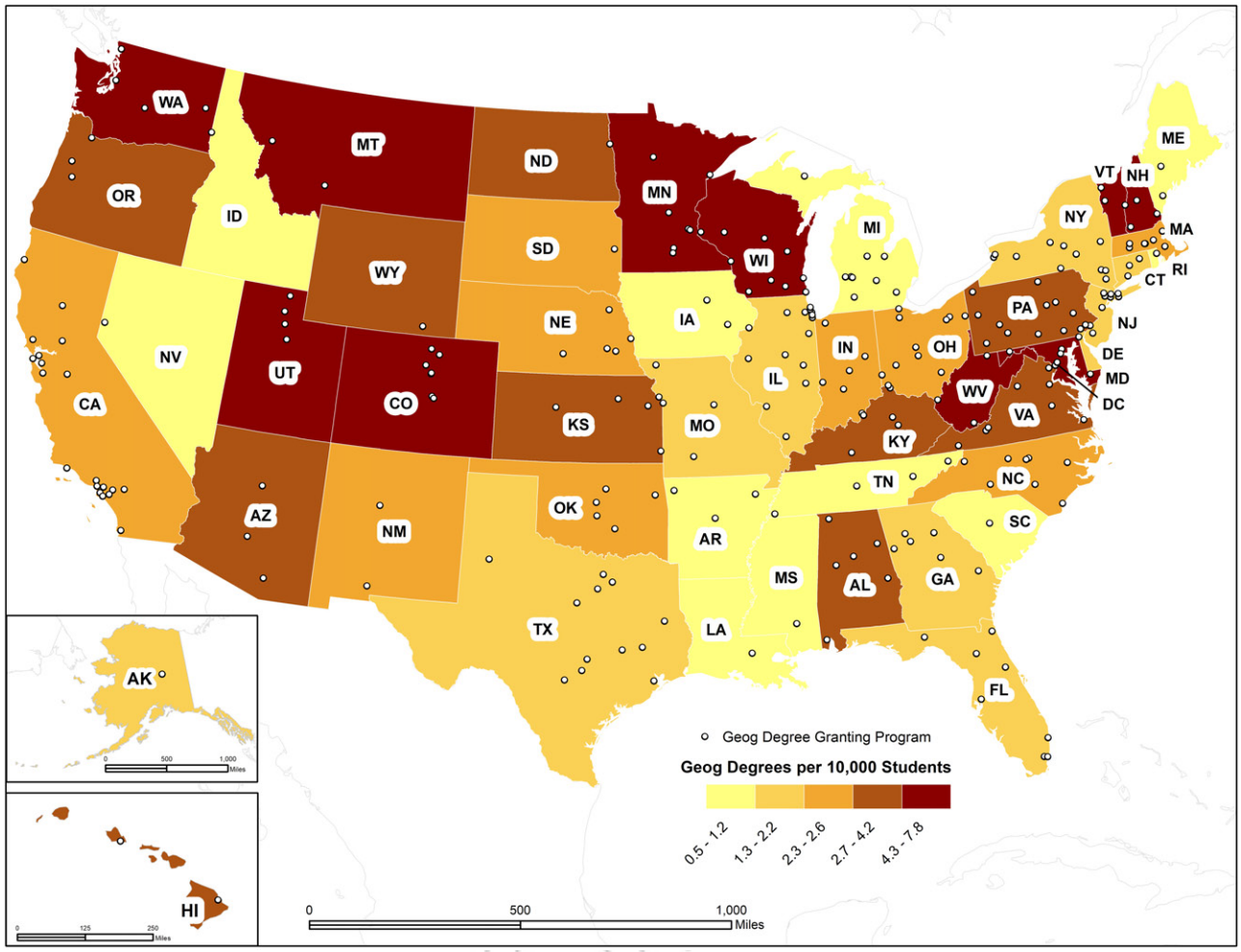

Figure 3. Bachelor's degrees in geography by state. (Color figure available online.)

to offer APHG. Some schools that might otherwise wish to offer geography in general or APHG in particular may not be able to find teachers with a suitable professional background and so do not offer the course.

Fourth, state geography alliances can increase the number of teachers willing and able to offer APHG. This is due to alliances providing workshops for teachers to strengthen their background in geography, demonstrate teaching methods and lesson plans, and offer useful instructional materials. Some states require teachers offering AP courses to obtain an endorsement to their teaching credential, and this may be accomplished by completing an AP summer institute (Mitchell and Hare 2018).

There could be additional influences upon the presence of APHG in school districts that in turn shape the state pattern, namely, the issue of federal education standards such as Common Core State Standards. Common Core emphasizes skill development rather than subject content knowledge (Kenna and Russell 2014). States and/or districts wishing to offer courses that have natural opportunities to teach critical thinking would likely find APHG an attractive option. Alternately, schools grappling with the administrative challenges of meeting both federal and state standards might not wish to take on the extra work of increasing geography's presence within an already competitive social studies curriculum. With federal and state standards to be met, compliance and success are measured by standardized testing. If geography is not specifically evaluated in these tests, perhaps school districts lack an incentive to offer APHG.

Explaining the variation in geography bachelor's degrees between states and regions is more challenging. Since each college or university determines its academic program, the presence or absence of geography at that institution is the result of the individual campus's history and mission. This being said, there are a few possible explanations for the patterning in bachelor's degrees in geography.

There is a greater likelihood of geography being offered at public rather than private universities (Adams, Solis and McKendry 2014). This in turn may be the result

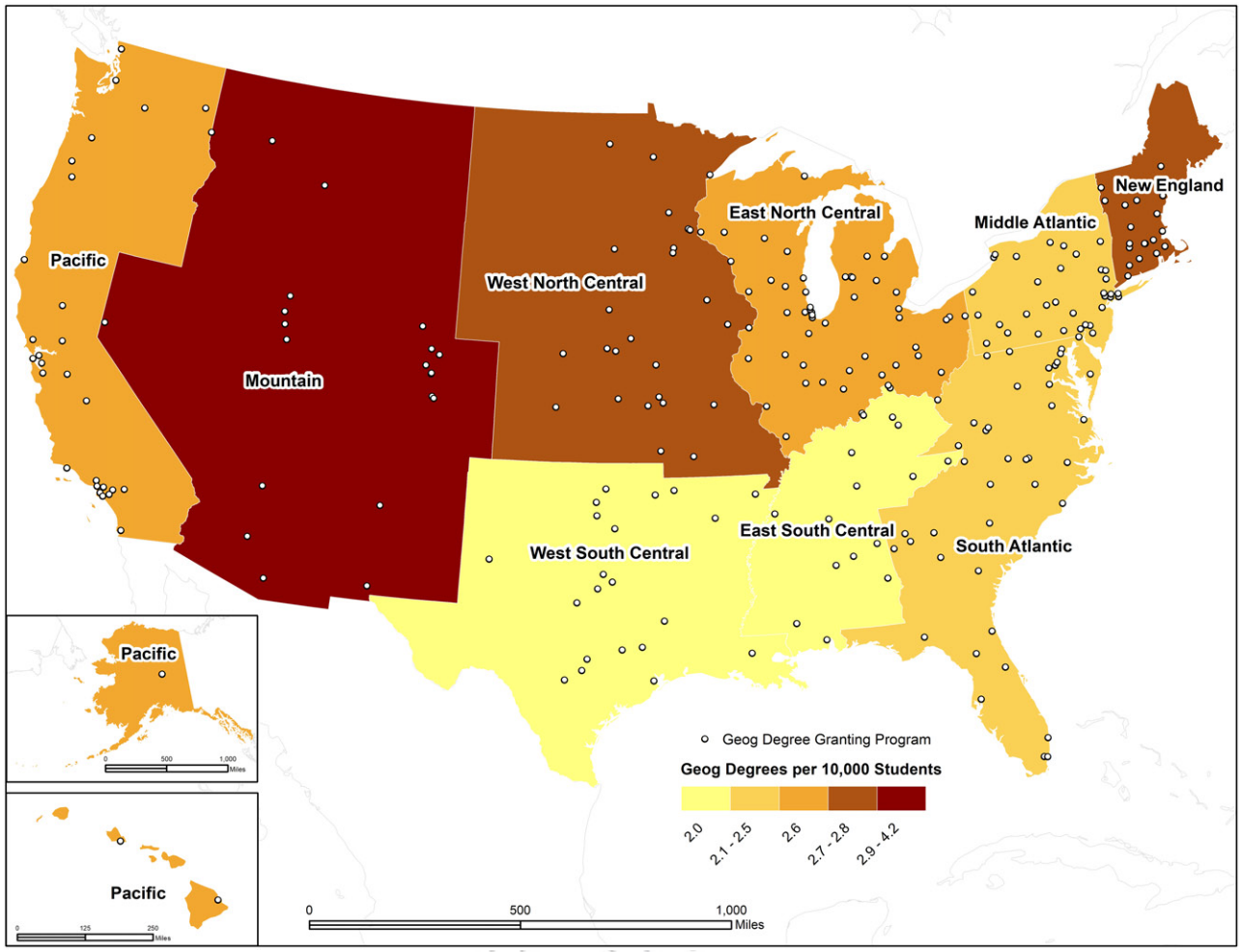

Figure 4. Bachelor's degrees in geography by region. (Color figure available online.)

of geography's role in teacher education programs. When states began the process of converting publicly supported teachers colleges into comprehensive institutions during the 1960s, geography programs that were necessary to support teacher education continued as part of a broader curriculum in a comprehensive university. States with a teachers college system may have gained comprehensive universities with geography programs.

In some parts of the United States, particularly the Northeast, private colleges and universities are especially numerous and often quite prominent. These private institutions are less likely to have geography departments as they may not have ever had a teacher training function. Private institutions of higher education are often smaller colleges with a liberal arts curriculum and thus may not have departments/programs in all subjects typically found at comprehensive universities.

The 260 institutions offering a geography bachelor's degree are not evenly distributed across the country. While no states are lacking a geography degree-granting institution, 12 states have just a single source of undergraduate degrees in geography. Seven states have 10 or more higher education campuses offering a bachelor's degree in geography, with California at the top with 20 (see also Tables 3 and 4). Concentrations of geography departments are found in states with larger populations, some of which are the traditional Midwestern core of academic geography. California has two large clusters of university geography departments in the San Francisco and Los Angeles metropolitan areas. States with smaller, more dispersed populations have fewer geography departments, which is apparent in much of the Great Plains and Inter-Mountain West.

States that are in the higher quintiles for numbers of APHG exams given are not always the same states that are in the higher quintiles for bachelor's degrees earned in geography. For example, many of the states in the southeastern United States have higher rates of APHG exams yet lower rates of bachelor's degrees in geography. One of the anticipated benefits of establishing

APHG was the expected boost it would give to enrollment in university geography departments (Gray, Hildebrant, and Strauss 2006). In theory, a student who completed APHG would be more likely to take a college-level course, thus increasing postsecondary enrollments in geography and closely related fields such as environmental studies or regional studies. The rapidly increasing number of APHG exams taken across the country is not likely to hurt postsecondary geography enrollment, but it may not be such a direct, significant enhancement as originally thought.

We suggest two reasons for this disconnect between rates of APHG exams and bachelor's degrees in geography: the location of geography departments, and the large number of students who take APHG in grade 9. First, if a student who completed APHG intends to enroll at a local university but that institution does not offer geography courses, then the increase in enrollment in geography courses and geography degrees awarded will not occur.

The location of geography departments offering a bachelor's degree very much matters vis-à-vis the existence of geography deserts. While students can leave their home area or state to attend college elsewhere, issues of cost, family obligations, or lack of knowledge about institutions outside the home area may limit the number of students who do so. In a study of high school graduates in the United States, Alm and Winters (2009) looked at the decisions by students who attended public high schools in Georgia and enrolled in colleges and universities that are part of the University System of Georgia (USG). Alm and Winters found that the choice of which USG college/university to attend was strongly influenced by distance, with higher enrollment rates at any one public university from the nearest school districts. The closest university with a geography department might be a considerable distance from home and even in another state, which would raise the cost of housing, travel, and tuition if paying out-of-state tuition to a public university. The distance from a student's home to the nearest university with a geography department may be a contributing influence upon this disconnect between growing numbers of APHG exams and flat or slightly increased numbers of geography bachelor's degrees.

Some geography departments have small numbers of majors and so may find themselves at risk of closure or merger with other departments. Should a university close a geography department or drop from offering a major to just a minor due to low enrollment or any other reason, the local area may no longer have a source of undergraduate degrees (Murphy 2007). The geography desert may grow in size.

A second reason for this lack of carryover between high school and college enrollment in geography is that so many of the students taking APHG do so as ninth graders. Scholz (2014) found that students in Texas taking APHG in grade 9 were less likely to major or minor in geography than students who took the course during grades 10–12. In the school years after completing APHG, the interests of these students might shift to other subjects. Students taking the course in grade 9 are more likely to struggle with the course. They have not yet taken high school history courses that would prove helpful in learning the material, and their study skills, writing skills, and critical thinking abilities are not as developed as a student in grade 11 or 12. If students struggle in the course and/or earn a low score on the APHG exam, they may not have a positive experience with geography and so may be less inclined to take additional courses in college. With each additional year that APHG is offered, the relationship between the existence of this course and undergraduate students majoring in geography should become clearer.

Conclusion

Hillman (2016) argues that places without convenient access to 4-year higher education institutions are education deserts. Adapting Hillman's ideas to the prevailing secondary and postsecondary curriculum in the United States, areas without close proximity to secondary schools offering APHG and higher education institutions offering a major in geography could constitute a geography desert. Is there a geography desert in the United States? Without data that give the total number of students taking a K–12 or postsecondary geography course on an annual basis by state, we used the best available data. The evidence from APHG and bachelor's degrees is mixed for the country as a whole, but localized areas within states could be described as geography deserts. Even if a geography major is available at a university or a school offers APHG, when very small numbers of students study geography at that institution the analogy to a desert is still appropriate.

In light of the findings presented in the preceding, we make several recommendations. It seems that geography as an academic discipline in the United States is in need of a spatial strategy to remedy this uneven distribution of opportunity. States and regions where geography is studied less commonly in secondary and postsecondary education need to be the focus of a sustained effort to increase the quality and quantity of geography education. California, which had about 12 percent of the U.S. population in 2016, is one state that might be part of an intense focus on increasing opportunities to study geography. In 2015 its rate for APHG exams ranked 25th and its rate for bachelor's degrees in geography ranked 28th (Tables 1 and 3). Because of California's population size, even a modest increase in the rate at which students there take APHG or complete a bachelor's degree in geography would represent a sizable increase in the total number of students with a significant formal learning experience in geography.

New England is a second place that could be part of an enhanced spatial strategy. While the population of the six states collectively is not that large compared to other states and regions, it is home to some of the country's most prestigious colleges and universities. Expanding geography's presence in top-tier higher education institutions would allow future leaders in government, business, and other prominent fields to learn to think spatially and environmentally (Cutter 2000). Growth in geography in New England would possibly increase the number of private higher education institutions that offer geography, especially liberal arts colleges (Bjelland 2004).

There are some states and regions that have higher or lower rates of both APHG exams and bachelor's degrees in geography across the 10-year study period. At the state scale, Minnesota, Colorado, and Utah appear in the top quintile and Mississippi in the bottom quintile for both APHG and bachelor's degrees. At the region scale, there are no regions that occupy the top or bottom quintiles in both data types. However, the Mountain region occupies the top quintile in bachelor's degrees and the second highest quintile in APHG exams.

Since states with higher rates of APHG exam completion are not always states with higher rates of geography bachelor's degrees, it seems important to learn why the rising numbers of APHG exams do not result in more bachelor's degrees in geography (Scholz 2014). This linkage needs to be researched and steps need to be taken to increase the potential connection between secondary and postsecondary geography instruction (Leydon, McLaughlin and Wilson 2017).

All of the major geography organizations in the United States have sought to strengthen the status of the discipline nationally. The National Geographic Society (NGS) system of state geographic alliances, launched in the 1980s and active until its planned replacement with a regional schema in 2018, is one way to focus attention on K–12 opportunities in specific states or clusters of states. The AAG has regional divisions that could also facilitate a heightened awareness of educational opportunities at the postsecondary level. Faculty and administrators involved with either the NGS alliances or AAG regional divisions are the most knowledgeable about their area's potential for expanded geography instruction. One possibility is to identify postsecondary institutions with strategic plans that emphasize curricular goals that are inherently geographic, such as being environmentally conscious. Those universities could then be approached with the suggestion of introducing or expanding the geography curriculum. A second approach is to look into the Mountain region, which has higher rates of students taking APHG and completing undergraduate degrees in geography. What conditions or circumstances led to the higher rates? Perhaps the four major geography organizations can discover new ways to support geography education in the states and regions with the lowest rates of APHG exams and bachelor's degrees awarded in geography, and thereby lessen the differences between states and regions.

This study has possible future utility in periodic updates to determine whether progress is being made in addressing some of the states and regions where the formal opportunity to study geography is the weakest. It would also be beneficial to select particular states and regions and assess the opportunities within that area to study geography. Is the opportunity found throughout the state or region? Is geography offered only at a handful of institutions in one part of the state/region, resulting in a geography desert elsewhere? Geographers and researchers in the field of education might investigate other spatial aspects of education systems to create a larger literature on the geography of education.

In the United States, where a person lives while completing his or her secondary and possibly higher education will substantially influence the likelihood of that person having a significant formal learning experience in the subject of geography. The community of professional geographers and educators should aspire to reduce if not eliminate the uneven spatial distribution of the opportunity to study geography. Shrinking possible localized geography deserts would be good for the overall education of the American public and for geography as a discipline.

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References

Adams, J. K., P. Solis, and J. McKendry. 2014. The landscape of diversity in U.S. higher education geography. *The Professional Geographer* 66 (2):183–94.

Alm, J., and J. V. Winters. 2009. Distance and intrastate college student migration. *Economics of Education Review* 28 (6):728–38.

American Association of Geographers. 2017. *Guide to geography programs in the Americas 2016–2017*. Washington, DC: AAG.

Andrews, A. C. 1974. Some demographic and geographic aspects to community colleges. *Journal of Geography* 73 (2):10–6.

Anthamatten, P. 2004. State geography standards in 2004. *Journal of Geography* 103 (4):182–4.

Bailey, R. M., and R. W. Dixon. 2007. Inclusion of national geography standards in mandatory and voluntary state curriculum frameworks. *Research in Geographic Education* 9 (2):104–23.

Bednarz, S. W. 2016. Placing Advanced Placement Human Geography: Its role in U.S. geography education. *Journal of Geography* 115 (3):84–9.

Bednarz, S. W., S. G. Heffron, and M. Solem. 2014. Geography standards in the United States: past influences and future prospects. *International Research in Geographical and Environmental Education* 23 (1):79–89.

Bjelland, M. D. 2004. A place for geography in the liberal arts college? *The Professional Geographer* 56 (3):326–36.

Brock, C. 2013a. Comparative education and the geographical factor. *Journal of International and Comparative Education* 2 (1):9–17.

Brock, C. 2013. The geography of education and comparative education. *Comparative Education* 49 (3): 275–89.

Brock, C. 2016. *Geography of education: Scale, space and location in the study of education*. New York: Bloomsbury Academic.

Brysch, C. P. 2014. *Status of geography education in the United States*. Washington, DC: National Geographic Society Education Foundation.

Butler, T., and C. Hamnett. 2007. The geography of education: introduction. *Urban Studies* 44 (7):1161–74.

The College Board. 2017. AP Data – Archives Data. Accessed 27 December 2017. https://research.collegeboard.org/programs/ap/data/archived.

Croot, D., and B. Chalkley. 1999. Student recruitment and the geography of undergraduate geographers in England and Wales. *Journal of Geography in Higher Education* 23 (1):21–47.

Cutter, S. L. 2000. Bring geography back to Harvard and Yale and …. *AAG Newsletter* 35 (10):2–3.

de Blij, H. J. 2012. *Why geography matters – more than ever*. New York: Oxford University Press.

D'Amico, A. 2018. E-mail to first author from NCES Postsecondary, Adult & Career Education (PACE) Team, 16 March.

Dorschner, D. L., and R. O. Marten. 1990. The spatial evolution of academic geography in the United States. *Journal of Geography* 89 (3):101–8.

Fink, L. D. 1979. The changing location of academic geographers in the United States. *The Professional Geographer* 31 (2):217–26.

Geography Education National Implementation Project 2017. State-level Geography Education Indicator Data: Map Series. Accessed 27 December 2017. http://genip.weebly.com/map-series.

Gerlach, J. D. 1979. The origins of professional geographers in the United States 1972–1977. *The Professional Geographer* 31 (2):212–7.

Gray, P. T., Jr., B. S. Hildebrant, and T. R. Strauss. 2006. Advanced Placement Human Geography: The first five years. *Journal of Geography* 105 (3):99–107.

Halvorsen, A. 2013. K–12 history education: curriculum, instruction and professional development. In *The status of Social Studies: Views from the field*. eds. J. Passe and P.G. Fitchett, 169–179. Charlotte, NC: Information Age Publishing.

Hillman, N. W. 2016. Geography of college opportunity: the case of education deserts. *American Educational Research Journal* 53 (4):987–1021.

Holloway, S. L., and H. Jöns. 2012. Geographies of education and learning. *Transactions of the Institute of British Geographers* 37 (4):482–8.

Hones, G. H., and R. H. Ryba. 1972. Why not a geography of education? *Journal of Geography* 71 (3): 135–9.

Janelle, D. G. 1992. The peopling of American geography. In *Geography's inner worlds: Pervasive themes in contemporary American geography*. eds. R.F. Abler, M.G. Marcus and J.M. Olson, 363–390. New Brunswick, NJ: Rutgers University Press.

Kenna, J. L., and W. B. Russell. III. 2014. Implications of common core state standards on the social studies. *The Clearing House: A Journal of Educational Strategies, Issue and Ideas* 87 (2):75–82.

Koelsch, W. A. 2001. East and midwest in American academic geography: Two prosopographic notes. *The Professional Geographer* 53 (1):97–105.

Lanegran, D. A., and D. J. Zeigler. 2016. Advanced Placement® Human Geography: Looking back and looking ahead. *Journal of Geography* 115 (3):90–4.

Leydon, J., C. McLaughlin, and H. Wilson. 2017. Does the high school geography experience influence enrollment in university geography courses? *Journal of Geography* 116 (2):79–88.

Martin, G. J. 1998. The emergence and development of geographic thought in New England. *Economic Geography* 74:1–13.

Mitchell, J. T., and P. R. Hare. 2018. Professional development for the Advanced Placement® Human Geography teacher: Present practice and prospects for change. *The Geography Teacher* 15 (2):68–79.

Moore, Z. A. 2004. *Report on the status of geography education in the United States*. Washington, DC: National Geographic Society for Geography Education National Implementation Project.

Munroe, S., and T. Smith. 1998. *State geography standards: An appraisal of geography standards in 38 states and the District of Columbia*. Washington, DC: Thomas B. Fordham Foundation.

Murphy, A. B. 2007. Geography's place in higher education in the United States. *Journal of Geography in Higher Education* 31 (1):121–42.

Paek, P. L., E. Ponte, I. Sigel, H. Braun, and D. Powers. 2005. *A portrait of advanced placement teacher practices (research report no. 2005–7)*. New York: College Board.

Scholz, M. 2014. An Analysis of the Performance and Subject Interest of 9th Grade Students Taking the Advanced Placement Course in Human Geography. Ph.D. diss., Department of Geography, Texas State University.

Smith, N. 1987. Academic war over the field of geography": The elimination of geography at Harvard, 1947–1951. *Annals of the Association of American Geographers* 77 (2):155–72.

Stoltman, J. P., B. Blouet, S. Hollier, A. Standish, and A. Conrad. 2005. Research opportunities with Advanced Placement Human Geography. *Research in Geographic Education* 7:5–20.

Taylor, C. 2009. Towards a geography of education. *Oxford Review of Education* 35 (5):651–69.

U.S. Bureau of the Census. 2017. American Community Survey, Table B14001 School Enrollment by Level of School for the Population 3 Years and Over. Accessed 27 December 2017. https://factfinder.census.gov/bkmk/table/1.0/en/ACS/15_1YR/B14001/0100000US.04000

U.S. Department of Education. 2017. National Center for Education Statistics, Integrated Postsecondary Education Data System. Accessed 27 December 2017. https://nces.ed.gov/ipeds/Home/UseTheData.

U.S. Government Accountability Office. 2015. *K–12 education, most eighth grade students are not proficient in geography. Report #16-7*. Washington, DC: U.S. G.A.O.

Wdowiarz, J. 2005. *Status of geography in high school graduation requirements and exit exams: GENIP report 2005*. Washington, DC: National Geographic Society for Geography Education National Implementation Project.