Connecting Local Governmental Finances to Local Health Outcomes in Texas:

A FINAL REPORT

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Summary

Previous research has demonstrated a link between higher public expenditures for public health and social services and better health outcomes at the county level. As such,understanding the financial resources available and investments made at the county level are important for understanding population health outcomes and as a lever by which policymakers could intervene to improve population health in their communities. The two goals of this project are (1) to provide a descriptive overview of local government spending within Texas counties on public health and a range of relevant social services, and (2) to explore the association between increased expenditures for public health and social services and improved public health outcomes for counties within the Episcopal Health Foundation's (EHF's) service area.

Our analyses showed that EHF service area counties tend to have lower per capita spending on public health and social services than other Texas counties. However, key categories such as public health and fire and ambulance have seen upticks from 2010-2012 (the most recent year for which data are available). Our regression models suggest that additional investment in four areas might be tied to improvements in population health at the county level within EHF's service area: public health, fire and ambulance, housing and community development, and libraries.

Approach

For this study, we rely on two main data sources.

First, we measure county health outcomes and health factors by leveraging the Robert Wood Johnson Foundation-funded County Health Rankings (CHR) data available through the countyhealthrankings.org website. This rich county-level data source covers the years 2010-2017 and ranks counties based on health outcomes such as premature mortality, physical and behavioral health status, and low birthweight. These data are the study's health outcomes of interest. The CHR also rank counties based on health factors such as obesity rate, smoking rate, environmental quality, and socioeconomic factors. These data were used as a control variable in the project's regression models.

Second, we bring a novel data source containing annualized estimates of local public spending for health and social services for all U.S. counties, including Texas. Our analyses incorporate data for all Texas counties and will focus in particular on the 57 EHF service-area counties. These data come from the U.S. Census Bureau's Census of Governments, a rich but relatively untapped source of financial data for federal, state, and local governments. The Census of Governments collects information on expenditures, revenues, and debts for all jurisdictions in the United States; jurisdictions are compelled to participate by federal statute. For the last several decades, data have been collected from all local governments every five years and from a stratified sample of local governments in the intervening years. Our team recently developed a methodology to obtain annualized estimates of expenditures, revenues, and debts for all counties. All governments within a county area are included in the figures reported in this analysis, meaning that all tables and figures represent spending aggregation of *all governments* with in a given county and their spending on each category in a given year. The Census Bureau reports data across nearly every service category imaginable. This project focuses on a group of 14 key categories: public health, public hospitals, and 12 critical social services as listed in the box shown on the following page. Please see the appendix for the definitions used by the Census Bureau for each category.

From a group of 14 relevant services, we used regression models to identify spending categories with statistically significant relationships with population health outcomes in Texas. Spending totals from all governments within a county area were aggregated and analyzed using three approaches:

- **Spending per capita:** dollars spent for a given category per person living within a county (used in descriptive statistics and bivariate tables and figures)

- **Percentage of total expenditures:** total expenditures for a given category divided by the total local governmental expenditures in the county (used in descriptive statistics and bivariate tables and figures)

- **Yearly deviation from county mean:** Difference (in dollars) between spending for a given category in a given county in a given year and the mean spending for that category for that county across all years in the sample (used in regression models)

Spending Categories Examined:
1. **Public Health**
2. **Public Hospitals**
3. **Corrections**
4. **Fire and Ambulance**
5. **Housing and Community Development**
6. **K-12 and Higher Education**
7. **Libraries**
8. **Natural Resources**
9. **Parks and Recreation**
10. **Protective Inspections**
11. **Public Welfare**
12. **Sewerage**
13. **Transportation**
14. **Waste Management**

These spending data are the study's main predictors of interest. After obtaining, cleaning, and coding all relevant data, we merged the two data sources to create our analytic dataset. This consisted of 14 financial variables for 57 counties across 4 years. We calculate descriptive statistics regarding county-level public expenditures in relation to county-level health outcomes. Analyses include basic descriptive and bivariate statistics. We provide visualizations in an accompanying Tableau dashboard reflecting these descriptive findings. In order to determine the association between increased local government expenditures and public health outcomes, we used regression models to determine the longitudinal effect of additional local public health, public hospital, and social services spending on local health outcomes for Texas counties. Multilevel mixed-effects linear regression models predicted a county's change in health outcomes rank based on changes from four years prior in each spending category (using the "yearly deviation from county mean" spending variables defined above) after accounting for mean spending in each category, county health factors ranking, and county and state random effects. Rankings data (and changes projected by our model) are standardized within the state of Texas, including by those within and outside the EHF service area.
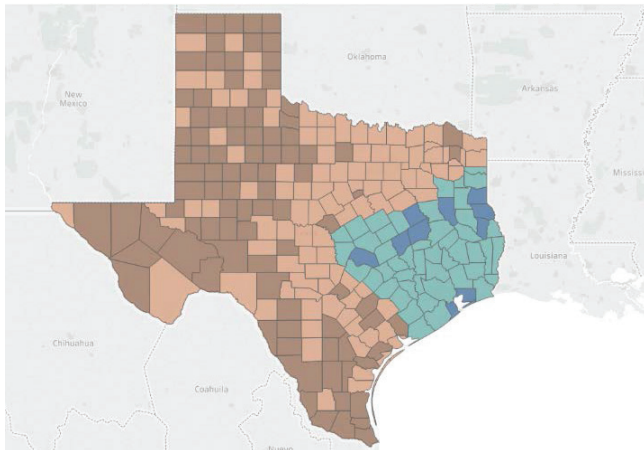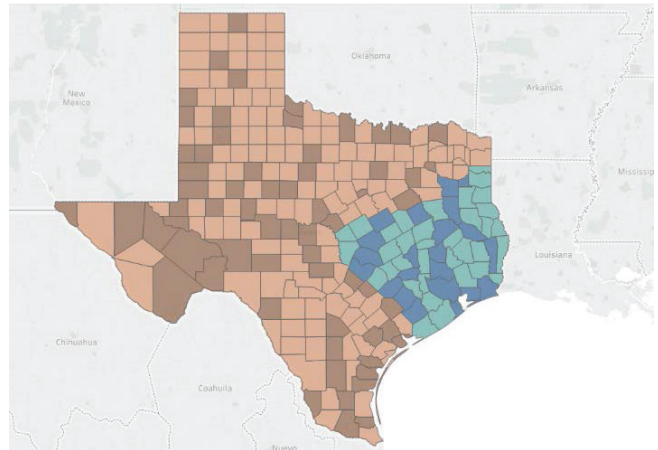
Findings

EHF area
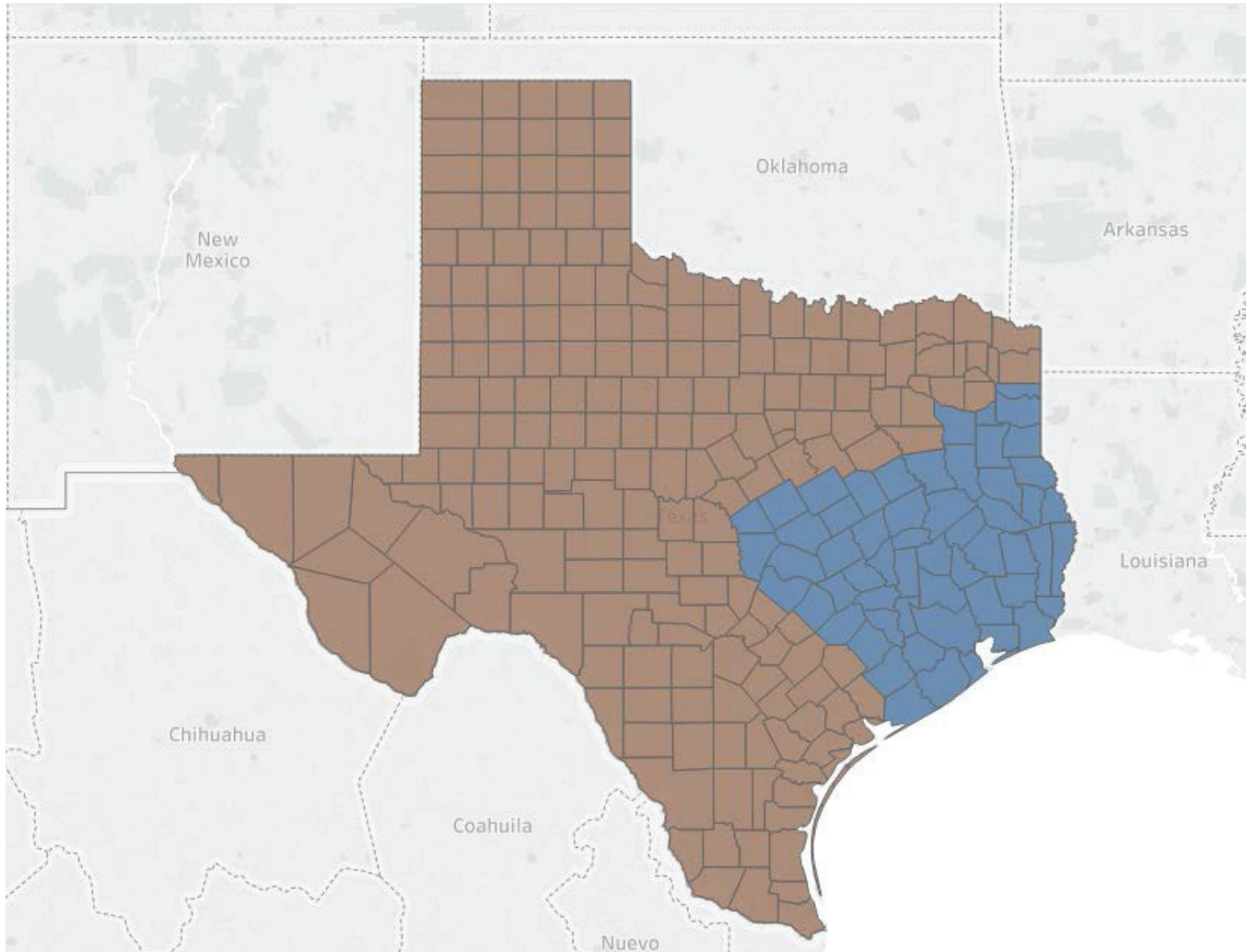
Our analyses pertain largely to the 57 counties in the EHF service area, as well as comparisons between state averages, non-EHF county averages, and EHF county averages. EHF counties include Anderson, Angelina, Austin, Bastrop, Bell, Brazoria, Brazos, Burleson, Burnet, Chambers, Cherokee, Colorado, Coryell, Falls, Fayette, Fort Bend, Freestone, Galveston, Gregg, Grimes, Hardin, Harris, Harrison, Houston, Jasper, Jefferson, Lampasas, Lee, Leon, Liberty, Limestone, Madison, Marion, Matagorda, McLennan, Milam, Montgomery, Nacogdoches, Newton, Orange, Panola, Polk, Robertson, Rusk, Sabine, San Augustine, San Jacinto, Shelby, Smith, Travis, Trinity, Tyler, Walker, Waller, Washington, Wharton, and Williamson.
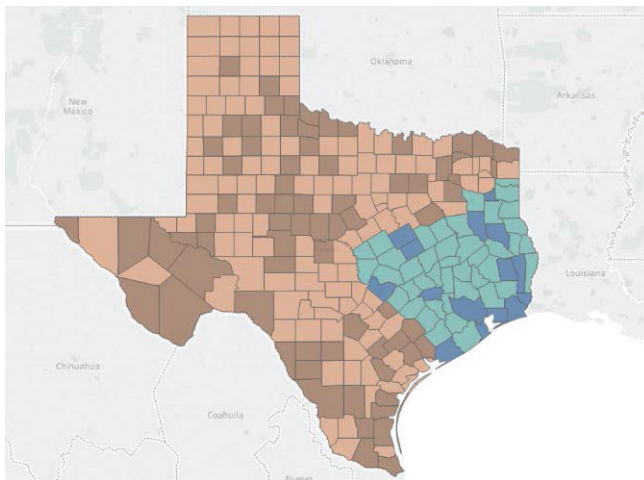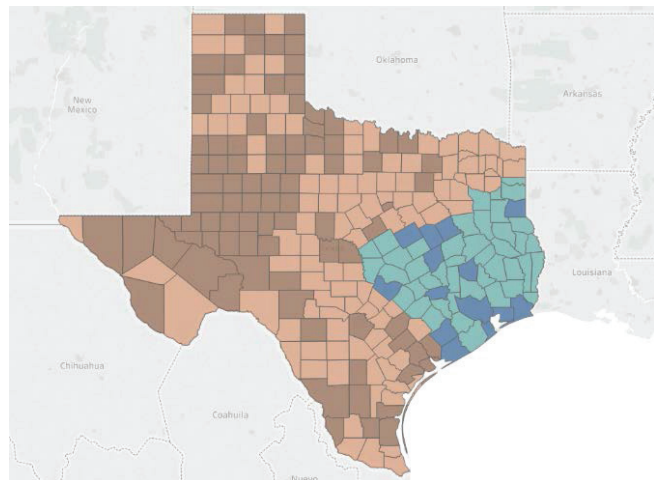
Spending on social services compared to state average

County Elementary education spending relative to state average ($1,937) in 2012.

County Non-hospital health spending relative to state average ($61) in 2012.

County Housing spending relative to state average ($56) in 2012.

County Total spending relative to state average ($4,877) in 2012.

Spending vs. state average
- Non-EHF, Higher
- Non-EHF, Lower
- EHF, Higher
- EHF, Lower

These maps show county area per capita spending relative to the state average for a given year. Also shown is EHF vs non EHF counties. Generally, EHF counties spend less than the state average.

For example, across the 57 EHF counties with spending data for 2012, 40 spent under the state per capita median for Total Expenditures, Corrections was 25 under and 31 over (25 / 31), Elementary Education (42 / 14), Fire and Ambulance (26 / 30), Judicial (31 / 25), Public Health (28 / 28), Public Hospitals (56 / 0), Highways (28 / 28), Housing & Community Benefit (29 / 27), Libraries (26 / 30), Natural resources (31 / 25), Parks & Recreation (32 / 24), Police Protection (31 / 25), Protective Inspections (22 / 34), Public Welfare (22 / 34), Sewerage (24 / 32), and Solid Waste Management (39 / 17).

Per capita spending in 2010-2012

Spending over time by category

Spending Category	2010 EHF	2010 State	2011 EHF	2011 State	2012 EHF	2012 State	2013 EHF	2013 State	2014 EHF	2014 State
Corrections	$83	$77	$89	$80	$87	$79	$88	$82	$88	$77
Elementary Education	$1,949	$2,251	$1,809	$2,059	$1,650	$1,937	$1,616	$1,983	$1,745	$2,117
Fire and Ambulance	$54	$53	$57	$55	$60	$59	$61	$60	$67	$64
Higher Education	$116	$112	$119	$113	$109	$108	$114	$111	$125	$121
Housing	$42	$53	$48	$55	$50	$56	$52	$60	$53	$62
Other	$1,416	$1,577	$1,396	$1,616	$1,420	$1,678	$1,452	$1,796	$1,489	$1,903
Parks & Recreation	$43	$50	$42	$49	$42	$49	$48	$53	$39	$54
Police	$175	$175	$184	$184	$189	$191	$192	$193	$198	$198
Public Health	$69	$57	$76	$60	$77	$61	$75	$61	$74	$64
Public Hospital	$161	$489	$153	$499	$155	$529	$121	$514	$128	$502
TOTAL	**$4,113**	**$4,929**	**$3,988**	**$4,814**	**$3,856**	**$4,877**	**$3,837**	**$4,991**	**$4,034**	**$5,219**

This table shows EHF vs state average spending by major category over time. Elementary education remains the greatest area of expenditure by local governments. Fire and ambulance, public health, housing, and police spending all increased during the 3 years shown.

Reported per capita public health spending in 2012

by all governments, by county area

County area	Per capita spending	County area	Per capita spending
Newton	$0	Falls	$27
Waller	$0	Matagorda	$34
Leon	$0	Brazoria	$43
Nacogdoches	$1	San Augustine	$51
Trinity	$2	Burnet	$53
Sabine	$2	Austin	$53
Harrison	$3	Colorado	$64
Tyler	$3	Brazos	$66
Limestone	$3	Jasper	$73
San Jacinto	$3	Washington	$79
Robertson	$3	Bell	$82
Anderson	$4	Harris	$87
Bastrop	$5	Montgomery	$90
Lampasas	$6	Fayette	$99
Coryell	$8	Chambers	$115
Grimes	$9	McLennan	$120
Rusk	$9	Williamson	$121
Burleson	$12	Walker	$137
Polk	$13	Houston	$138
Hardin	$14	Smith	$152
Lee	$15	Cherokee	$158
Liberty	$17	Jefferson	$193
Shelby	$18	Galveston	$240
Milam	$19	Gregg	$245
Fort Bend	$19	Travis	$298
Panola	$20	Angelina	$354
Madison	$20	Freestone	$450
Orange	$23	Wharton	$510
Marion	$25		

All governments within a county area report financial data to the US census. This table represents an aggregation of *all* governments with in a given county and their public health spending in 2012. The range is substantial – mean $78 per capita, median $25, standard deviation $109, minimum $0, maximum $510 per capita. Further work to unpack why certain counties are seeing such high and low per capita spending amounts may yield important and actionable information regarding the (potential) linkages between public health spending and population health outcomes.

Reported per capita public hospital, education, and social services spending in 2012

by all governmental entities, by county area

County area	Corrections	Elementary Education	Fire & Ambulance	Higher Education	Housing	Libraries	Other	Parks & Rec	Police	Public hospital	Total
Anderson	$55	$1,442	$44	$0	$5	$20	$750	$14	$101	$0	$2,414
Angelina	$44	$1,656	$87	$330	$23	$7	$911	$64	$158	$0	$3,628
Austin	$47	$1,569	$33	$0	$16	$9	$1,224	$27	$215	$7	$3,191
Bastrop	$92	$1,556	$30	$0	$34	$14	$1,068	$28	$162	$355	$3,331
Bell	$79	$1,675	$97	$443	$46	$17	$1,020	$75	$172	$0	$3,690
Brazoria	$79	$1,448	$42	$218	$30	$20	$1,426	$70	$174	$149	$3,679
Brazos	$87	$1,265	$128	$0	$26	$16	$2,725	$94	$176	$0	$4,568
Burleson	$75	$1,441	$17	$0	$19	$5	$1,077	$14	$118	$2	$2,775
Burnet	$258	$1,418	$89	$0	$31	$17	$1,566	$168	$194	$0	$3,777
Chambers	$32	$2,195	$7	$0	$138	$14	$1,731	$202	$192	$294	$4,906
Cherokee	$53	$2,147	$48	$0	$64	$8	$741	$15	$127	$0	$3,352
Colorado	$66	$1,701	$11	$0	$0	$16	$1,320	$26	$187	$444	$3,820
Coryell	$28	$1,237	$52	$0	$23	$10	$1,145	$34	$115	$336	$2,978
Falls	$31	$1,616	$24	$0	$70	$12	$938	$15	$132	$0	$2,851
Fayette	$81	$1,461	$5	$0	$45	$12	$1,228	$13	$159	$0	$3,091
Fort Bend	$70	$1,277	$51	$0	$8	$30	$1,667	$40	$130	$0	$3,263
Freestone	$92	$2,248	$55	$0	$53	$68	$3,761	$54	$793	$400	$8,054
Galveston	$96	$2,174	$83	$189	$361	$23	$2,515	$116	$278	$0	$6,053
Gregg	$106	$1,929	$174	$325	$70	$16	$1,232	$81	$218	$1	$4,381
Grimes	$47	$1,577	$27	$0	$0	$8	$1,444	$24	$118	$0	$3,246
Hardin	$30	$1,500	$27	$0	$0	$10	$659	$6	$157	$0	$2,391
Harris	$66	$1,747	$111	$213	$91	$18	$1,931	$42	$251	$380	$4,918
Harrison	$176	$1,887	$162	$0	$49	$8	$849	$19	$141	$0	$3,286
Houston	$109	$1,278	$75	$0	$53	$7	$838	$13	$158	$66	$2,727
Jasper	$0	$1,595	$65	$0	$130	$13	$1,245	$12	$232	$0	$3,353
Jefferson	$139	$1,868	$171	$0	$116	$19	$2,018	$108	$322	$0	$4,935
Lampasas	$84	$1,568	$47	$0	$6	$9	$1,200	$44	$178	$0	$3,133
Lee	$81	$1,575	$5	$0	$0	$17	$1,379	$33	$175	$0	$3,263
Leon	$36	$2,105	$8	$0	$25	$3	$693	$4	$82	$0	$2,953

County area	Corrections	Elementary Education	Fire & Ambulance	Higher Education	Housing	Libraries	Other	Parks & Rec	Police	Public hospital	Total
Liberty	$81	$1,562	$28	$0	$39	$12	$1,053	$9	$152	$0	$2,940
Limestone	$572	$1,770	$92	$0	$32	$11	$1,738	$26	$616	$658	$5,603
Madison	$0	$1,527	$8	$0	$55	$0	$700	$12	$183	$0	$2,505
Marion	$11	$1,195	$6	$0	$20	$2	$501	$3	$152	$0	$1,913
Matagorda	$78	$1,847	$6	$0	$144	$16	$1,998	$52	$191	$3,095	$7,444
McLennan	$161	$1,722	$93	$243	$126	$18	$2,410	$123	$240	$0	$5,240
Milam	$111	$1,682	$14	$0	$21	$7	$918	$20	$116	$54	$2,954
Montgomery	$94	$1,522	$91	$0	$17	$17	$1,215	$56	$168	$106	$3,359
Nacogdoches	$52	$1,461	$83	$0	$114	$8	$859	$40	$154	$1,350	$4,115
Newton	$555	$1,412	$237	$0	$30	$8	$735	$0	$259	$0	$3,228
Orange	$52	$1,520	$85	$0	$89	$9	$1,644	$20	$243	$0	$3,677
Panola	$115	$2,155	$49	$668	$55	$21	$1,862	$79	$178	$0	$5,182
Polk	$41	$1,462	$21	$0	$31	$10	$1,430	$18	$142	$0	$3,158
Robertson	$66	$3,260	$11	$0	$36	$30	$2,149	$17	$181	$0	$5,722
Rusk	$80	$1,459	$34	$0	$15	$16	$777	$20	$109	$0	$2,503
Sabine	$1	$1,341	$10	$0	$41	$10	$846	$2	$140	$598	$2,981
San Augustine	$0	$2,318	$13	$0	$15	$19	$927	$21	$194	$0	$3,539
San Jacinto	$39	$1,113	$47	$0	$0	$0	$624	$0	$87	$0	$1,914
Shelby	$9	$2,106	$19	$0	$24	$8	$790	$6	$151	$0	$3,124
Smith	$124	$1,323	$73	$308	$39	$7	$917	$21	$166	$0	$3,124
Travis	$145	$1,292	$158	$231	$134	$33	$4,592	$135	$330	$0	$7,315
Trinity	$54	$1,494	$3	$0	$3	$1	$1,122	$0	$51	$255	$2,984
Tyler	$2	$1,567	$276	$0	$100	$0	$741	$0	$126	$0	$2,897
Walker	$38	$990	$24	$0	$28	$6	$4,348	$31	$118	$0	$5,714
Waller	$43	$1,706	$4	$0	$0	$10	$1,082	$12	$143	$0	$2,989
Washington	$52	$1,299	$48	$2,155	$92	$14	$2,091	$78	$192	$0	$6,086
Wharton	$69	$1,674	$41	$880	$6	$21	$976	$37	$213	$273	$5,299
Williamson	$62	$2,131	$82	$0	$18	$17	$1,612	$76	$158	$0	$4,260

This table shows reported per capita spending for all governments within a given county area for 2012 – for all tracked categories except public health spending (shown on the previous page).

Spending composition by county in EHF area
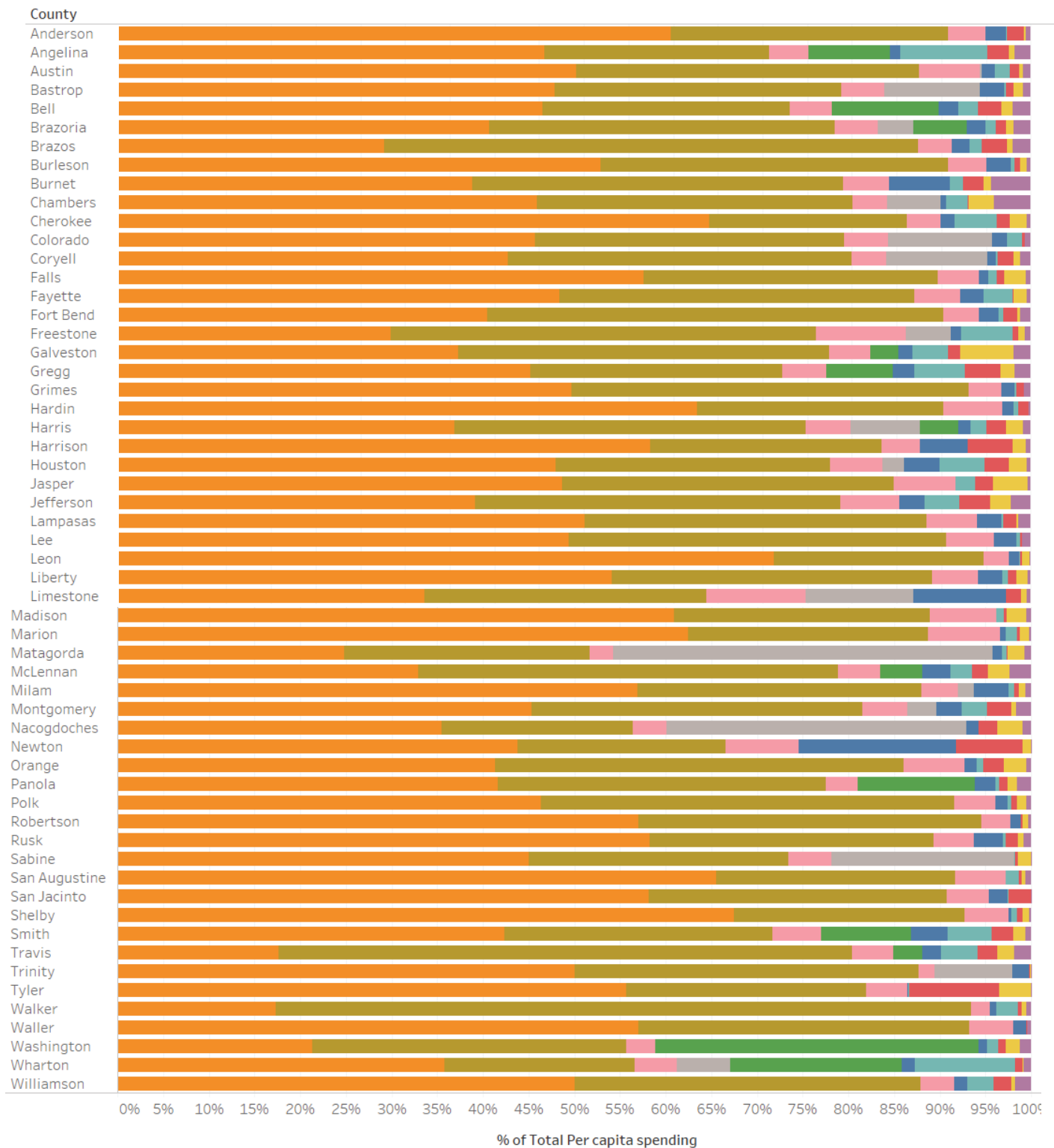
Whereas the table on the previous page showed per capita spending by county and category, this chart illustrates the percent distribution of spending by category and county. Counties spend a sizable portion of their total budget on Elementary Education, police, public hospitals, higher education, and corrections.

Regression Model Results

Average rankings improvement by per capita increase in spending for EHF counties, 2012
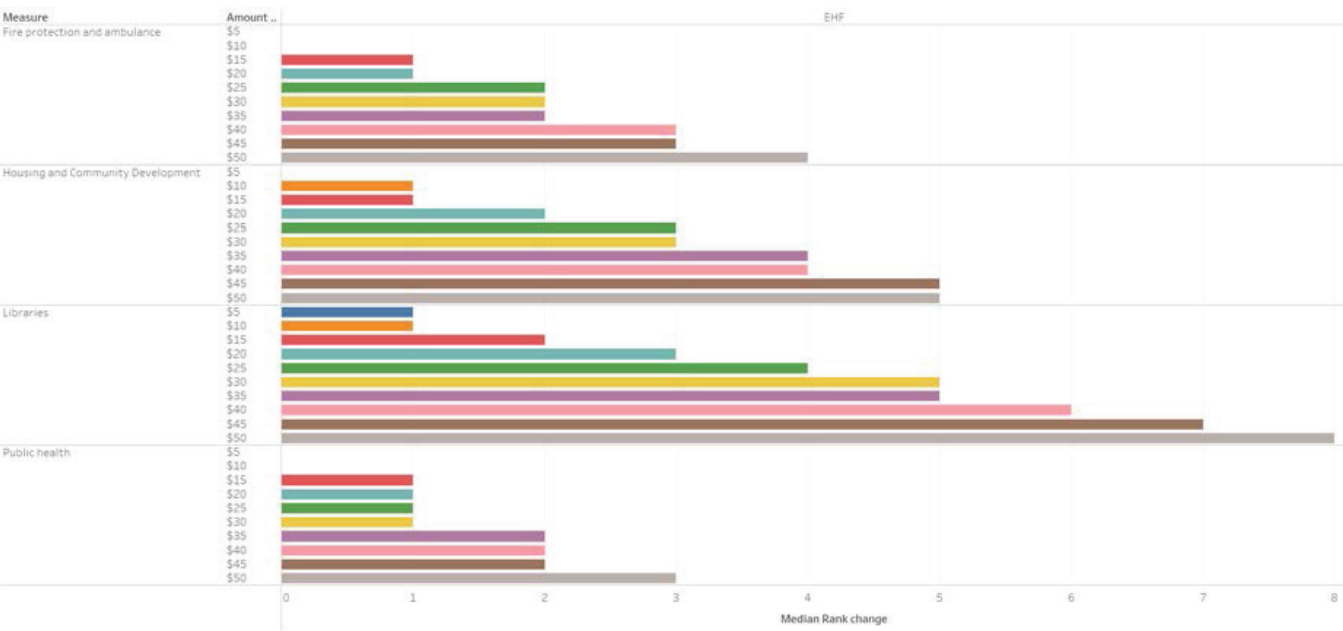
This chart shows regression model predictions for how county health outcome rankings might be expected to change if counties spent more in given categories. Not all spending categories were associated with significant changes in health outcomes, but four were. As this chart shows, spending more on public health (relative to what had been spent by that county in previous years) is associated with a modest improvement in that county's health outcomes. An additional, one-time investment of $15 per capita is predicted to lead to a 1 spot gain in statewide county health rankings within 4 years. Similarly, investment in fire and ambulance, housing and community development, and libraries would also yield improved health outcomes (and so improvements in the rankings).

Regression Model Results

Dynamic rank adjustment – PART 1 –
changes in health outcome ranking based on per capita spending changes

Housing	Public Health	Fire and ambulance	Library	Median rank change	Total extra
0	0	0	30	5	30
0	0	10	20	4	30
0	0	20	10	3	30
0	0	30	0	2	30
0	10	0	20	4	30
0	10	10	10	3	30
0	10	20	0	2	30
0	20	0	10	3	30
0	20	10	0	2	30
0	30	0	0	1	30
10	0	0	20	4	30
10	0	10	10	3	30
10	0	20	0	2	30
10	10	0	10	3	30
10	10	10	0	2	30
10	20	0	0	2	30
20	0	0	10	4	30

Please Note: This table is dynamically generated. Viewed on paper, it appears to be a static table, but viewed in Microsoft Word, it can be modified through double-clicking the table itself and changing the filters in the top row. These filters allow the user to determine the hypothetical increase in per capita spending amount simultaneously across four major areas of spending. Model results (shown in the final column) suggest that may be synergies – increased spending across multiple categories yields better performance than single larger investments alone.

Regression Model Results

Dynamic rank adjustment – PART 2 –
setting desired rank improvement

Housing	Public Health	Fire and ambulance	Library	Median rank change	Total extra
0	0	0	20	3	20
0	0	20	10	3	30
0	0	40	0	3	40
0	10	10	10	3	30
0	10	20	10	3	40
0	10	30	0	3	40
0	10	40	0	3	50
0	20	0	10	3	30
0	20	10	10	3	40
0	20	30	0	3	50
0	30	0	10	3	40
0	30	20	0	3	50
0	40	10	0	3	50
0	40	20	0	3	60
0	50	0	0	3	50
0	50	10	0	3	60
10	0	0	10	3	20
10	0	10	10	3	30
10	0	30	0	3	40
10	10	0	10	3	30
10	10	20	0	3	40
10	20	10	0	3	40
10	30	0	0	3	40
10	30	10	0	3	50
10	40	0	0	3	50

Please Note: This table is dynamically generated. Viewed on paper, it appears to be a static table, but viewed in Microsoft Word, it can be modified through double-clicking the table itself and changing the filters in the top row and last column. This filter allows the user to determine the desired rank improvement (e.g., improvement of 3 spots, as shown in the table), and shows the multiple investments that might bring an EHF county to that point over time.

This table shows that there are multiple ways in which a county might choose to allocate additional investments in public health and social services in order to achieve improvements in population health in their communities.

APPENDIX: Spending Categories and Definitions

TABLE A1:

Public health and social services spending categories and official U.S. Census Bureau definitions

Expenditure Category	Census Bureau Definition
Public Health	Provision of services for the conservation and improvement of public health, other than hospital care, and financial support of other governments' health programs. *(Referred to by Census Bureau as "Health–Other")*
Corrections	Residential institutions or facilities for the confinement, correction, and rehabilitation of convicted adults, or juveniles adjudicated, delinquent or in need of supervision, and for the detention of adults and juveniles charged with a crime and awaiting trial.
Fire and Ambulance	Prevention, avoidance, and suppression of fires and provision of ambulance, medical, rescue, or auxiliary services provided by fire protection agencies. *(Referred to be Census Bureau as "Fire Protection")*
Housing and Community Development	Construction, operation, and support of housing and redevelopment projects and other activities to promote or aid public and private housing and community development.
K-12 Education	The operation, maintenance, and construction of public schools and facilities for elementary and secondary education (kindergarten through high school), vocational-technical education, and other educational institutions except those for higher education. Covers operations by independent governments (school districts) as well as those operated as integral agencies of state, county, municipal, or township governments. Also covers financial support of public elementary and secondary schools.
Libraries	Establishment and provision of libraries for use by the general public and the technical and financial support of privately-operated libraries.
Natural Resources	Expenditures related to water resources, mineral resources, agriculture, and the regulation of industries which develop, utilize, or affect natural resources, as well as the regulation of agricultural products and establishments. Includes conservation, promotion, and development activities related to agriculture and natural resources (soil, water, energy, minerals, etc.). For state governments, expenditures in this function cover activities not reported in other Natural Resources functions.
Parks and Recreation	Provision and support of recreational and cultural-scientific facilities maintained for the benefit of residents and visitors.
Protective Inspections	Regulation and inspection of private establishments for the protection of the public or to prevent hazardous conditions NOT classified under another Census Bureau function, and the regulation of professional occupational licensing.

APPENDIX: Spending Categories and Definitions

TABLE A1 *continued*:

Public health and social services spending categories and official U.S. Census Bureau definitions

Expenditure Category	Census Bureau Definition
Public Hospitals	Expenditures related to a government's own hospitals as well as expenditures for the provision of care in other public hospitals. Own hospitals are facilities directly administered by the government, including those operated by public universities. Other expenditures cover the provision of care in other hospitals and support of other public hospitals. This function also covers direct payments for acquisition or construction of hospitals (whether or not the government will operate the completed facility) and payments to private corporations that lease and operate government-owned hospitals.
Public Welfare	All classes of welfare programs, including direct benefit transfers and administrative programs.
Sewerage	Provision,maintenance, and operation of sanitary and storm sewer systems and sewage disposal and treatment facilities, as well as all intergovernmental payments for such activities.
Transportation	Maintenance, operation, repair, and construction of highways, streets, roads, alleys, sidewalks, bridges, tunnels, ferry boats, viaducts, and related non-toll structures.
Waste Management	Collection, removal, and disposal of garbage, refuse, hazardous, and other solid wastes and the cleaning of streets, alleys, and sidewalks.