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Rural Bioethics: The Alaska Context

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Abstract
With by far the lowest population density in the United States, myriad challenges attach to healthcare delivery in Alaska. In the "Size, Population, and (In)Accessibility" section, we characterize this geographic context, including how it is exacerbated by lack of infrastructure. In the "Distributing Healthcare" section, we turn to healthcare economics and staffing, showing how these bear on delivery—and are exacerbated by geography. In the "Health Care in Rural Alaska" section, we turn to rural care, exploring in more depth what healthcare delivery looks like outside of Alaska's major cities. This discussion continues in the "Alaska's Native Villages" section, which specifically analyzes healthcare in Alaska's indigenous villages, some of the smallest and most isolated communities in the United States. Though many of the ways we could improve Alaskan health care for Alaskan residents are limited by its unique features, the "Justice and Healthcare Delivery" and "Technology and Telemedicine" sections consider ways in which certain policies and technology—including telemedicine—could mitigate the challenges developed in previous sections.

Keywords Alaska · Rural healthcare · Indigenous health · Bioethics

Size, Population, and (In)Accessibility

Alaska has fewer than 800,000 residents, making it 47th population-wise in the United States—only North Dakota, Vermont, and Wyoming have fewer (United States Census Bureau 2018). At the same time, though, it is the largest state, spanning over 650,000 square miles (United States Census Bureau 2010b, p. 41). To put this in context, it is more than double the size of the second-largest state, Texas (United States Census

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Bureau 2010b, p. 41).[1] While these statistics might be surprising, it is their combination that gets interesting: Alaska has the lowest population density in the county, by far. At approximately 1.3 residents per square mile, it not only ranks lowest, but is less than 25% that of second-lowest Wyoming, and only .06% that of New Jersey, the nation's highest (United States Census Bureau 2010b, p. 41).[2] In other words, it is not just that Alaska is sparsely populated, or that it is huge, it is that it is both.

We can press further. Almost half of Alaska's population is in Anchorage and another 10% live in Juneau or Fairbanks (Alaska Department of Labor and Workforce Development 2017). Taking out those cities, there are some 200,000 residents living in a geographical area over half the size of the "lower 48" (Alaska Department of Labor and Workforce Development 2017; United States Census Bureau 2010b). To further complicate things, over 86% of Alaska municipalities are unconnected to a major road system (Alaska Department of Labor and Workforce Development 2017, p. 48); Anchorage to Fairbanks has a main artery on the Parks Highway, but even getting from the largest city (Anchorage) to the state's capital (Juneau) takes a 20-hour drive, much of which is through Canada. Certain other areas (e.g., the Kenai Peninsula, including Seward and Homer) are connected by roads to Anchorage, but much of the state is literally unreachable but for water or air. Including, as alluded to previously, the *majority* of Alaska's municipalities and almost a quarter of its population. While the size and population of Alaska already set it apart, the *inaccessibility* is yet a third major obstacle.[3]

Distributing Healthcare

At $11,064 per capita annually, Alaska has higher health care costs than any other state (Kaiser Family Foundation 2018).[4] But, the issues here are not quite as simple as square mileage, population, and inaccessibility. To be sure, those contribute to health care costs: smaller cities would not generally benefit from economies of scale in the way that larger ones would. If the small size makes particular resources cost-prohibitive, increased travel for care also inflates the comparative cost of care—whether that is because rural communities might need to travel to Anchorage, or even Seattle for some specialized care.[5] Rather, *everything* is more expensive in

[1] Consider also that the largest national park in the United States is Wrangell-St. Elias, which is over 12,500 square miles. This park alone is about the size of Maryland and would be about the 42nd largest state (United States Department of Interior 2018; United States Census Bureau 2010b).

[2] This is just counting the states: it is .003% that of Washington, D.C. (United States Census Bureau 2010b, p. 41).

[3] The fact that this inaccessibility is due to environmental reasons also limits solutions and confounds the structure of obligations. We return to this issue in the "Justice and Healthcare Delivery" section.

[4] Washington, D.C. has a higher cost at $11,944 (Kaiser Family Foundation 2018).

[5] Just to be clear, Anchorage has excellent care, whether through Providence Alaska Medical Center—a major private hospital—or the public or tribal facilities, Alaska Regional Hospital and Alaska Native Medical Center (ANMC), respectively. Both Providence and ANMC are Level II trauma centers, the most advanced in a state that otherwise has nothing above Level IV (Alaska Department of Health & Social Services 2018b). The closest Level I trauma center is Harborview Medical Center, in Seattle, which services Washington, Alaska, Montana, and Idaho (University of Washington Medicine 2018).

Alaska, ranging from building materials to energy to food, much of which comes from out-of-state and has to be freighted in (see, e.g., U.S. Energy Information Administration 2018; Alaska Department of Labor & Workforce Development 2019).

Medical staffing, though, is also an obstacle, both in terms of expense and availability. Alaska is one of five states that participates in WWAMI, an acronym representing the participants: Washington, Wyoming, Alaska, Montana, and Idaho. WWAMI comprises a collaborative medical training initiative across these states, coordinated through the University of Washington School of Medicine (University of Alaska Anchorage 2018a). This program started in Fairbanks in 1971 and moved to Anchorage in 1989 (University of Alaska Anchorage 2018a). The big change, though, was in 2015 when students became able to do their pre-clinical rotations—called the "Foundation Phase"—in their own states, rather than in Seattle (University of Alaska Anchorage 2018a). They can stay in their states through the clinical clerkships as well, thus never having to leave. This substantially lowers a barrier to entry and has been a great success.

The challenge remains, though, that even if Alaskans have access to medical training, either: (1) they may yet choose to leave the state after graduation; or (2) regardless, the *intra*-state distribution of providers remains daunting. As discussed above, almost half the population lives in Anchorage and another principal share in Fairbanks or Juneau. But, that still leaves a couple hundred thousand Alaskans spread throughout the rest of the state, with no other city having a population of more than 10,000 people—and, as we shall see below, many residents do not live in cities at all. There has been a creative solution, though, which is to leverage loan forgiveness. The State offers complete loan forgiveness for any student who either spends three years in a rural setting or five years in an urban one (Alaska Department of Health and Social Services 2018a).[6] The scale of this program has been small, although it has recently expanded from 10 WWAMI seats to 20 (University of Alaska Anchorage 2018b). The loan forgiveness only exists, though, to the extent that the legislature can underwrite it, and so it constantly faces threats of budget exigency, particularly in a state so dependent on highly-volatile oil prices (McDonald 2016).[7]

Before moving on to rural care, let us also characterize the broad structure of Alaska healthcare, both in terms of facilities and insurance. There are five types of facilities in the State's system: acute care facilities, outpatient facilities, long-term care services and facilities, behavioral facilities, and emergency medical services (Alaska Department of Health & Social Services 2014, p. 3). These facilities are electronically connected via their electronic records system. Notably, this includes

[6] Problems with rural-track programs are still being analyzed and their effectiveness is still unclear. The literature indicates rural-rotations and rural training tracks have high rural retention rates, but it is unclear to what degree self-selection plays a role in these programs (Parlier et al. 2018, p. 5; Pathman et al. 1994). Financial incentives similar to the loan forgiveness Alaska offers are promising, although the effects might be short-lived. As it stands, we simply have not had enough of these programs for enough time to be able to study the long-term effects (Parlier et al. 2018, p. 6; Pathman et al. 2008).

[7] In the "Justice and Healthcare Delivery" section, we consider additional solutions, which are less sensitive to issues such as oil pricing.

patients carrying their electronic personal health records with them, usually on a digital memory stick (Alaska Department of Health & Social Services 2014, p. 3).

An alternative to carrying around one's own health records "manually" is the Tele-Health program. The Tele-Health program concerns itself with the secure transmission of data, images, and even video-conferencing and consultation between healthcare providers and facilities (Innovations Exchange Team 2013; Korkesh et al. 2004). Not only does this relieve the burden on patients by storing and transmitting their records securely, but it also aids healthcare providers by providing them with access to better educated healthcare providers or even specialists (Innovations Exchange Team 2013; Korkesh et al. 2004). Especially for low- and mid-level healthcare providers in rural settings, this access can prove crucial for providing important care while awaiting transportation in time-sensitive cases. The structure of healthcare in Alaska is paramount given its unique challenges, and innovations like the Tele-Health program greatly help the distribution of care; we return to this discussion in the "Technology and Telemedicine" section.

The distribution of healthcare is not the only field to receive recent innovative solutions. A novel and important part of Alaska's healthcare system in the past few years has been their wildly successful reinsurance program. The State was facing incredibly high insurance premiums in 2016 with expectations for it to increase by 40% in 2017 (Aleccia 2017). If those predictions were fulfilled, Alaska faced fiscal disaster. To prevent the economic disaster, it diverted the money from its tax on insurance plans to create a $55 million reinsurance fund that covers exceptionally high-cost patients (Aleccia 2017). Because of Alaska's tiny population, high-cost patients are especially burdensome on the insurance structures. For example, Alaska had $67 million in healthcare insurance claims, but $16 million (over 23%) from just 20 patients in 2016 (Aleccia 2017). This solution, called the Alaska Reinsurance Program, appears to have worked—premiums only rose by 7.3% rather than the expected 40% in 2017 (Aleccia 2017).

After the reinsurance program's success in 2017, Alaska applied to the federal government for reimbursement (Walker 2018). This request was granted and the program has continued to receive federal funding, including upwards of $58 million in 2018 (Walker 2018). This program saved insurers and the state from financial disaster. In fact, Premera (an insurance company operating in Alaska) gave a one-time payment of $25 million to the state of Alaska after the program was so successful that Premera's costs were at a 10-year low; simultaneously, they announced that their premiums would be lowered by 22.4% in 2018 (Earl 2017). Despite anticipated premium decreases, the average insurance plan in Alaska remains one of the highest in the nation, about a $904 premium for the average plan (Cox et al. 2016, p. 1).

Health Care in Rural Alaska

Rural health care presents many difficulties because the distance between any person and a center for health care—especially technical, specialized healthcare—is much larger than in urban areas. Further, the physician-to-patient ratio is much higher in rural

areas; there are about 500 more persons per physician in rural areas than urban areas (Parlier et al. 2018, p. 1). Worse yet, rural health care has received little attention in both the medical and the ethical literature (Nelson et al. 2007, p. 1; Nelson et al. 2010).[8]

Alaska's rural healthcare problems are compounded by the aforementioned ratio of its immense size to its tiny population. All "ordinary" rural problems are multiplied by an order of magnitude. Transportation to specialized care, for example, is not just dozens of miles away, but potentially hundreds. This is further complicated by the fact that Alaska has "229 federally recognized tribes formed almost exclusively of individual village tribes, accounting for about 140,000 people spread out in communities across 586,412 square miles of predominantly roadless land," many of whom speak primarily their indigenous language (Alaska Division of Public Health Section of Health Planning and Systems Development 2016, p. I-5). To give a particularly striking example of how severely Alaska is affected by its extreme rural status, the U.S. Health Resources and Services Administration mark out Health Professional Shortage Areas (HPSAs) in each state. Fully 96% of Alaska's landmass is marked as an HPSA, which is truly stunning (Alaska Division of Public Health Section of Health Planning and Systems Development 2016, p. I-7).

Even if the statewide ratio of providers to population looks favorable, that says nothing of how those providers are distributed within the state. That might be a minor issue in small states—like Rhode Island—but, in Alaska, it has daunting implications. For example, Alaskan dentist-to-patient ratios are comparable to national averages overall, but 62% of dentists practice in and around Anchorage. There is a large northern swath of territory with little-to-no dental coverage at all (Shoffstall-Cone and Williard 2013). Dentists are therefore commonly itinerant, with the priority being children's dental health in rural settings, for which checkups at least once a year are necessary (Shoffstall-Cone and Williard 2013). Much of Alaska's geography is also designated as dental-HPSA, even when the ratio does not take into account full-time equivalent work hours and transportation time to provide remote and rural areas with dental care (Whistler 2012, p. 26). Furthermore, many of these dentists are age 60 or older, leaving the future of Alaskan dentistry post-retirement somewhat uncertain (Shoffstall-Cone and Williard 2013, p. 25).

To make up for the lack of traditional healthcare professionals, the Alaska Native Tribal Health Consortium (ANTHC) does much of the work for primary care availability, providing over 200 communities with care (Alaska Native Tribal Health Consortium 2018). There are three levels of care provided: (i) village-based, which is largely community health aides and itinerant/contracted health care; (ii) sub-regional, which serves a group of villages with mid-level providers of dental, radiology, and laboratory services; and (iii) regional, which are hospitals. ANTHC provides training and resources for those working in village-based healthcare.

Alaska relies heavily on its low- and middle-level healthcare providers in the village-based and sub-regional levels of care mentioned above. It is one of the few states that allows for all nurse practitioners to have full practice rights and relies heavily on community health aides, with similar programs for other healthcare

[8] Fortunately, there has started to be work done in this field, but more still needs to be done. See Pathman et al. (2008), Parlier et al. (2018), and Nelson et al. (2010).

realms, like dentistry or behavioral health (American Association of Nurse Practitioners 2018, p. 1; Alaska Division of Public Health Section of Health Planning and Systems Development 2016, pp. 4–5).[9] The reason Alaska relies so heavily on community health aides stems from the nature of the role. These are not traditional professional healthcare providers; they are selected by their community for four training sessions lasting approximately 3–4 weeks each. They complete a practicum and a checklist of skills at their community aid center in the interim between sessions, and are eventually certified to give referrals to sub-regional doctors and give aid that is relatively risk-free given basic training—such as, practices to combat infant mortality rates, recognition of potentially dangerous symptoms, treatment of basic injuries, and treatment of infectious diseases like tuberculosis (Alaska Division of Public Health Section of Health Planning and Systems Development 2016, p. 13–14). There are approximately 380 certified Community Health Aides/Practitioners (CHA/P's) in over 170 Alaska villages (Alaska Native Tribal Health Consortium 2016, p. 4). Expansion of various healthcare roles such as CHA/P's—and more traditional positions, like nurse practitioners and physician's assistants—can play a key role in improving the patient-to-practitioner ratio in Alaska.

On a more interpersonal level, rural hospitals and their employees do not often have ethics committees or employees trained in bioethics, though many wish they did (Cook and Hoas 2010). Nurses in particular desire more resources in bioethics, although physicians reported the same at lower rates (Cook and Hoas 2010).[10] The five most reported issues in rural bioethics in a survey of more than 3500 physicians and nurses in several rural mainland states were (1) patients cannot follow medical recommendations because of cost; (2) transportation is a problem for patients who need health care, (3) patients fail to understand treatment; (4) there is insufficient time to meet patients' needs; and (5) patients fail to understand diagnosis (Cook and Hoas 2010). There are other hallmarks of ordinary rural health care that might also apply here: rural contexts have unique identifiers such as "shared values and beliefs, a strong work ethic, self-reliance, and a tendency for close-knit extended social structures where overlapping relationships are commonplace" (Nelson et al. 2010, p. 1). Unfortunately, it is unclear whether these results are representative of the medical situation in rural Alaska. We return to these issues in the "Justice and Healthcare Delivery" and "Technology and Telemedicine" sections.

Alaska's Native Villages

As mentioned above, Alaska has some 140,000 indigenous residents, spread out across almost 229 tribes almost exclusively made up of individual villages and their immediate rural environment (Alaska Division of Public Health Section of Health

[9] There are a few rural states that are experimenting with ever-more desperate and extreme policies. Missouri's 2014 law is illustrative of this: recent medical school graduates may practice primary care in underserved areas without completing their four-year residency at a hospital (Kardish 2014).

[10] Physicians felt similarly, although they are more willing to make decisions on their personal values, which were most commonly reported to be "peers and colleagues, faith in God, what my conscience guides me to do, pray, involve my wife/husband, deal with it the best I can" (Cook and Hoas 2010).

Planning and Systems Development 2016, pp. I–5).[11] These are broadly grouped among the thirteen regional corporations established under the Alaska Native Claims Settlement Act (1971), many of which also provide economic benefits to those communities through tribal dividends (Stricker 2017). While English is widely spoken in the villages, they have their own cultural and linguistic traditions (Alaska Division of Public Health Section of Health Planning and Systems Development 2016, pp. I–5). The Inuit-Yupik tradition dominates western and northern Alaska, whereas the Athabascan tradition dominates the interior (Holton et al. 2011). Smaller traditions continue to exist on the Aleutian peninsula (Aleut), as well as southeast Alaska (Tinglit and Eyak), among others (Holton et al. 2011). Not surprisingly—because of fishing and navigation—these communities tend to be concentrated along the water, especially the Bering Sea. Interior communities are often on rivers, particularly the Yukon and Kuskokwim, which are redolent with salmon (Alaska Department of Fish and Game 2018; Associated Press 2018).

From a healthcare delivery perspective, though, challenges abound. Populations of most villages tend to be 200–300 people, and nearly all the villages are off the road system—or only have internal roads that do not connect to other services. Villages may have clinics or itinerant services, but very rarely have substantially trained medical personnel in residence. Rather, they are generally configured such that a hub community of a few thousand people (e.g., Bethel, Nome, or Barrow)—with direct flights to Anchorage and/or Fairbanks—provides access (Alaska Division of Public Health Section of Health Planning and Systems Development 2016, pp. 4–6). For example, Ravn Air has three separate village routes that start in Nome: Nome-White Mountain-Golovin-Elim-Nome; Nome-Stebbins-St. Michael-Unalakleet-Nome; and Unalakleet-Koyuk-Shaktaoolik-Unalakleet (Flight Stats 2018a; 2018b; 2018c).

Nome is the center from which each of these loops originates, and some villages might only be separated by a few minutes in the air. The routes tend to be circular and so it might take several stops to get to one's destination, which vastly multiplies travel issues: to get to some villages could be 3–4 "up and downs", with all the attendant possibilities for delay, weather, technical difficulties, and so on. Nome connects to Anchorage—on Alaska Airlines, not Ravn—but even those flights might only run seasonally or else connect through some other hub community (e.g., Bethel, also on the west coast). However, the cost can be prohibitive: the Ravn circuit might be $200, plus another $400+to Anchorage. These communities generally lack earned income; the Permanent Fund Dividend,[12] tribal dividends (in only some villages), and tax credits (child tax credit, earned income credit) are all that many villagers have access to.

[11] For an excellent map, see (United States Census Bureau 2010a).

[12] The Alaska Permanent Fund was established under Article 9 § 15 of the Alaska Constitution in 1976. It is funded by oil revenues and has a current value of approximately $55 billion. Each year, it pays out a dividend—the Permanent Fund Dividend—to qualified residents. (Eligibility requirements are low, with incarceration being the principal barrier.) The annual payout depends on a five-year average of the Permanent Fund's performance, and has been between $1000–$2000 per resident (including children) in recent years.

Villages present their own series of health issues, many of which can be straightforwardly inferred from their comparative remoteness and inaccessibility. Some of these deficiencies are often remediated through itinerant care, such as having a dentist or hygienist visit each village for a couple of days each year. Annual physicals and other routine care may be handled similarly; the point being that a clinician per village might not be economically feasible, but a single clinician can be effectively shared across multiple villages. Travel presents an added expense, but maybe this could be partially offset by the lack of expenses undergirding a traditional clinical practice in, say, Anchorage: the itinerant clinician would not need urban office space, office staff, and so on—the administrative and logistical duties could be offloaded to the villages.

But surely emergency care hardly fits this model. As the flight patterns were meant to indicate, getting from a village to a major medical center (e.g., in Anchorage) would generally be at least two flights, one likely on light aircraft (i.e., propeller, not jet). Light aircraft are more susceptible to weather interference—comprising at least wind and fog, both substantial issues in rural Alaska—and so evacuations are rarely guaranteed. From some villages, trucks could access hub communities across frozen rivers, but this could be several hours' drive in difficult circumstances, with limited search and rescue options. Hub communities themselves have been building capacities, thus reducing the necessity for Fairbanks or Anchorage, but there are limits to what small towns in remote locations are going to be able to do and what expertise or technologies will be available. In Bethel's community, which serves almost 26,000 residents, there are a regional hospital and a family clinic. The regional hospital is a level IV trauma center, which lacks even its own surgeon (U.S. News 2018). Similarly, the Bethel Family Clinic is incredibly limited. It offers a full range of typical laboratory tests but would be unable to provide care most Americans are accustomed to, like appendectomies, not to mention lack of swift access to many pharmaceutical resources (Bethel Family Clinic 2018).

Even when the possibility for increased accessibility exists, it can come under political crossfire. For example, consider King Cove, Alaska, a small community of approximately 1,000 people in the Aleutian Islands. The Aleutians lack a substantial hub community, and so residents may have to go to Anchorage for serious health needs. There is a flight from King Cove to Cold Bay, and then another flight from Cold Bay to Anchorage. But because of King Cove's location, wind and fog often compromise flight availability. A workaround would be a road that would run around 25–30 miles, although the trip would take over two hours on average. But that road would have to run through the 315,000-acre Izembek National Wildlife Refuge, federally-owned land that inhabits brown bears, caribou, and—most importantly—almost the world's entire population of Pacific Black Brant geese (Haskett 2010). It also plays a critical role in the migration patterns of other migratory birds (Izembek National Wildlife Refuge Land Exchange/Road Corridor Final Environmental Impact Statement 2013). This has been a fraught issue politically, starting some 30 years ago. During the Obama Administration, Secretary Jewell declared the

environmental impacts of the road to be too high.[13] In the summer of 2018, Secretary Zinke (under the Trump Administration) effected a land swap that would release up to 500 acres of federal land to the King Cove Native Corporation, thus enabling them to build a road on their (i.e., as opposed to the government's) land; in return, other acreage of comparable value and use is to be ceded from the native corporation to the government (Eilperin 2018). But note that this also triggers broader issues in federalism: many Alaskans are certainly not so happy about a federal government thousands of miles away blocking their ability to build a road that underwrites the medical needs of its communities.[14] Starting in 1975, Alaskans implored the Board of Geographic Names to formally name the mountain Denali, in honor of its heritage. This move, though, was blocked by an Ohio congressman, Ralph Regula, who maintained his opposition through his retirement in 2009—and his death in 2017 (Schudel 2017). Before visiting Alaska in 2015, President Obama announced that the mountain would be renamed Denali, which Secretary Jewell did immediately (Davis 2015). (The Secretary of the Interior has the authority to do so if the Board of Geographic Names does not act within a "reasonable" period of time—40 years seemed long enough to wait.) Whether that is a fair way to look at it or not is not an issue we take a stance on, other than to highlight it as a source of conflict.

Prescription drugs are another challenge for rural communities. Even if they can be ordered online, villagers might not have access to a clinician who may write the prescriptions. In the next section, we will consider the prospects of telemedicine to redress this concern—and others—but suffice it to say that, at least for the foreseeable future, this portends a substantial obstacle. We can again differentiate between different types of care, say routine versus emergent care. If someone needs blood pressure medicine, for example, that can be prescribed annually by an itinerant clinician. But what of an infection? Antibiotics might just not be a possibility at all, simply because the villager would not have access to a clinician who could render a timely diagnosis and prescription.

[13] Izembek forms a curious, narrow isthmus that makes for a unique set of habitats. The United States Department of the Interior (2013) argued that the most harmful environmental impacts were primarily the ground-based disturbances roads would bring to the eelgrass beds in which the Pacific Black Brant forage and prepare for migration. While migratory birds are particularly sensitive to ground-based disturbances, Pacific Black Brants are even more so. Another vulnerable avian population endangered by the road are the non-migratory Tundra Swans, who have suffered a 75% population decline since 1980 (The United States Department of the Interior 2013). The proposed road directly bisects the Tundra Swans' nesting grounds, which would obstruct the rearing of their young. Other threatened, endangered, or affected species included the Emperor Geese (one of the rarest and most vulnerable geese in the world), Steller's Eiders, brown bears, caribou, and wolves. The area of land they would receive in return was considered insufficient (despite its much larger size) for offsetting the environmental damage to Izembeck due to the directness with which the road interferes with the natural habitats and the kinds of nature threatened (The United States Department of the Interior 2013).

[14] This issue was additionally sensitized by the naming of Mount McKinley, the tallest mountain in North America at 20,310 feet and a great source of pride for both the state and its indigenous communities. It was named after then-candidate William McKinley in 1896, who was from Ohio and went on to become the 25th President of the United States in 1897. McKinley favored a gold standard to which Alaskans were sympathetic given their statewide gold reserves, and so a prospector named it after him. But, the indigenous Athabascans had referred to it as Denali for centuries—meaning "high" in their language (Davis 2015).

There are a range of other concerns that pertain to living in Alaska; some exist in the cities as well, but might be more acute in the villages. For example, seasonal affective disorder (SAD) is problematic in the far north because sunlight hours in the winter are so short. Around the winter solstice, Anchorage might have 20 hours a day of darkness. On the north coast—including the major oil fields—the sun does not rise at all for 30 days in the winter. The summer sunlight is similarly extreme, and—aside from the potential for insomnia—carries all sorts of health benefits. That said, it would be too simplistic to assume the extended summer days countervail the winter darkness and the concomitant propensity for depression and other SAD symptoms.[15]

This is part of the reason that Alaska has the highest suicide rate in the country (Alaska Department of Health & Social Services 2013). Partially in recognition of this trend, Alaska has recognized the ability of local communities—including native villages—to exercise "local option" over alcohol (Local Option 2017). Many villages are either dry or damp (i.e., import only, no sales) (Alaska Department of Commerce, Community, and Economic Development 2018), but the laws appeared to have very little impact and alcoholism remains a substantial public health risk (Shively et al. 2008). The recent legalization of marijuana (2014) also presents challenges for villages, not all of which are equipped with appropriate resources, like substance abuse treatment programs—though the bigger risk may simply be economic insofar as residents have such limited resources and might invest in unsustainable recreation (Lopez 2015).[16]

Justice and Healthcare Delivery

Alaska faces unique and difficult challenges and has tried to meet them heroically. But, be it through structural, top-down changes or more focused, community-based approaches, healthcare still seems inadequate. Recall, however, that the main driver of these problems is largely environmental. The massive size and kind of terrain found in much of Alaska and the small population size combine to form an infrastructural nightmare. This is complicated by the fact that many of those affected belong to indigenous peoples, who are historically ignored and oppressed by the very institution purporting to discharge governmental obligations.

[15] To be sure, Hawaii is the most popular winter destination for Alaskans; Alaska Air services three islands during the winter, with multiple direct flights a day from Anchorage. But even with PFD sales and Alaska Airlines' Visa 2-for-1 sales—many Alaskans have this card for this reason—those vacations are not financially possible for the majority of residents.

[16] Lopez (2015) puts together a few pieces of data to make the case: marijuana mirrors tobacco in that lower-class individuals make up most of the users and marijuana is disproportionately expensive for lower-class individuals. Becoming dependent on marijuana could prove financially deadly for many Alaskan residents.

What sort of health care does a government owe to its residents? We do not wish to rehash arguments for or against universal health care coverage,[17] but there are issues specific to rural health care and Alaskan health care that might lead to unintuitive conclusions, such as unusual distributive justice configurations. Consider the rural context first. As we have discussed above, rural healthcare contexts face, *inter alia*, delivery problems that other contexts do not have to face. This creates an inequality in the health care quality of rural residents and urban residents. This leads to rather straightforward Rawlsian arguments—if we are to continue increasing the quality of health care for all residents, we should heavily favor solutions that help the worst-off the most (Rawls 1998, pp. 26–27). In this case, rural residents are worse-off than urban residents, and thus solutions that increase their quality of health care—even at the cost of greater gains in urban healthcare quality—are to be favored.

There are also serious issues of restitutive justice regarding the native Alaskan populations. The U.S.'s relationship with native peoples has been extremely fraught[18] and those accepting restitutive principles may be committed to a kind of reparative design for policy, in which injustices of the past put strong obligations on policy-makers to favor solutions that increase the quality of health care for rural residents—even at the cost of greater gains in urban healthcare quality—and therefore native Alaskans, who disproportionately reside in rural Alaska.[19]

Still, the infrastructure problems stemming from Alaska's environment limit what can be done; innovation in healthcare delivery and technology appear to be the best hope for fulfilling these obligations. In the remainder of this section, we will consider ways in which the system can be improved so as to be more just; in the next section, we will consider technological interventions that will further serve just outcomes.

First, consider the top-down approaches that may help Alaskans. There are two aspects of healthcare delivery that are particularly cumbersome: the difficulty of obtaining healthcare and the cost of healthcare once obtained. The first has already been addressed to some degree—the division of labor and increased autonomy presented by the CHA/P program and nurse practitioner legislation has significantly

[17] Rawlsian arguments for universal health care coverage are advanced most paradigmatically by Daniels (1981, 1985, 2008); other kinds of arguments extend from the work of Sen (1980, 1992), Arneson (1988), and Cohen (1989). Dworkin (1981, 1994, 2000) and Gibbard (1982) advanced yet a different kind. Each of these kinds of arguments have their own discussion, such as Arrow (1973) and Sen's (1980) criticisms of Rawlsian arguments. Other opposition to universal health care coverage has taken several forms, such as Engelhardt's complete opposition to positive obligations (1979). An interesting and relatively recent line springs from research on social determinants of health, pointing out that universal healthcare programs might not much help alleviate health inequities, reducing the power of many arguments from equality (Sreenivasan 2007). For a good summary, see Daniels (2017).

[18] While substantially outside the scope of the current paper, see Dunbar-Ortiz (2015) and Williams et al. (2009) for particularly insightful—and depressing—discussion. The strength of reparative arguments may be attenuated here because most of colonial wrongs were caused by Russians, but this argument may lose some force when considering the obligations of governments exchanging lands with wronged peoples on them. Additionally, there is plenty of harm done after America acquired Alaska (see, e.g., Peter 2009).

[19] We thank an anonymous reviewer for pressing us to expand this discussion.

increased the quantity and quality of care immediately available to Alaskans far from premium healthcare services. This sort of program shows promise and should continue to be funded and expanded as new tools become available. Nurse practitioners are already allotted much more autonomy and power than in other states (American Association of Nurse Practitioners 2018, p. 1; Alaska Division of Public Health Section of Health Planning and Systems Development 2016, pp. 4–5), and other such legislation might be extended to physician's assistants, for example. When the driving problem is access to healthcare, getting healthcare from some non-physician medical professional is still better than no healthcare at all.

On that front, the expansions of WWAMI are promising, but Alaska should further expand its medical program, both in terms of students and residents—and therefore also its faculty to attract more physicians since many physicians stay within 100 miles of their residency program (Fagan et al. 2015). Increasing the number of residents, then, appears to be the easiest and most straightforward method for increasing physician density. Other programs that have been successful at keeping trained physicians in the area—such as rural healthcare tracks in medical schools and residency programs—should be similarly expanded (Parlier et al. 2018, p. 5; Pathman et al. 1994). Because of the type and urgency of this problem, the state may need to fund part or all of the expansions to its medical school and residency programs. Ultimately, this will be a fiscally responsible move since fixing the problems of healthcare shortages by recruiting one's own physicians will be much cheaper in the long run than having to hire physicians by paying them enough to offset outside physician's preferences not to practice and live in Alaska.

Another benefit of such a move will be the tracks the medical school could offer alongside its physicians. Given the power nurse practitioners possess in Alaska, a steady output of nurse practitioners could greatly ease the scarcity of healthcare by practicing medicine in places like Alaska's hub communities (American Association of Nurse Practitioners 2018, p. 1; Alaska Division of Public Health Section of Health Planning and Systems Development 2016, pp. 4–5). Especially given Alaska's paucity of medical options for its residents, telemedicine also offers substantial promise; we will return to this below.

From a justice standpoint, though, we must also take into account the natural environment and geography of Alaska, which might well cut against substantial expansion of care, or at least justifiably get in the way of it, at least in certain cases. Alaska is home to more square miles of park and protected territory than any other state and comes in third for states with the highest percentage of landmass as federally-owned land, much of it protected (61.8%) (Vincent et al. 2017).[20] This is because of four interconnected reasons: (1) the land is considered inherently valuable or beautiful, to the degree that it has been set aside for the enjoyment of posterity or to protect certain ecosystems and species; (2) the land is needed for federal facilities (e.g., military); (3) the land is set aside for the indigenous peoples who reside on it; and (4) the land is to be used for development by the federal

[20] Nevada is number one and Utah is number two, with 81.1% and 61.5% respectively (Vincent et al. 2017).

government (Vincent et al. 2017, pp. 1–3). If the issue to be resolved is the ability to deliver healthcare in rural villages, some of these protected statuses may need to be revisited—or else that lack of care may need to be tolerated. As shown with the case of Izembeck mentioned above, even case-by-case investigations of the costs and benefits trigger complicated analyses, and delivery of medical care does not exist in a vacuum.

Technology and Telemedicine

Moving forward, technology offers to address some of the problems in rural health care delivery, though it is not a panacea. In this final section, we survey some of the promise of telemedicine, as well as its limitations. From the outset, consider "Operation Lindberg", a laparoscopic cholecystectomy (gallbladder removal) done remotely in 2001. Named after the famed aviator who crossed the Atlantic, this surgery was conducted by surgeons in New York City, on a 68-year-old female patient in Strasbourg, France. The surgeons conducted the operation with robotic surgical instrumentation, visually aided by an endoscopic camera and supported by trans-Atlantic fiber optics (Hoshowsky 2014).

Even before this surgery, computer-assisted surgical techniques were already on the rise. As far back as 1985, the Puma 560 assisted with brain biopsies and laparoscopic surgery. In 1988, prostatic surgery was performed by the Probot. In 1992, fittings in the femur were placed by the ROBODOC. These gave rise to the current generations, comprising AESOP, ZEUS, and the da Vinci Surgical System (Stefano 2017).

One obvious issue here is cost: the current da Vinci model runs as high as $2.5 million (Barbash and Glied 2010), which would be somewhere in the vicinity of $360M to put in each village, not counting the cost of operation and the operating surgeon's time.[21] But, that problem may not even be as substantial as two others. First, even if these were cost-effective, they *still require* on-site expertise (Densford 2018). The patient has to be prepped—perhaps including anesthesia—could need post-surgical care (including waste disposal), and so on. If there were complications during surgery, we would still want some sort of clinician available to assist (Densford 2018). The da Vinci machine itself requires maintenance personnel and additional single-use robot appliances for each operation (Barbash and Glied 2010). So, telesurgery likely still requires more health care personnel than would be available in rural Alaska, perhaps even highly-trained ones (e.g., anesthesiologists or surgical assistants).

Second, much of the promise of telemedicine relies on high-speed fiber optics, which are not available in rural Alaska. The local telecommunication provider, GCI, has made admirable progress on their coverage map, covering 97% of Alaskans (GCI 2018). However, the approximately 20,000 Alaskans that remain uncovered

[21] Even if one were to install one in each hub community, it would cost upwards of $40 million and would alleviate few of the problems we laid out earlier for the majority of Alaska's rural inhabitants.

are predominantly rural, and hence the focus of this paper. Regardless, cellular coverage is a far cry from high-speed fiber optics, particularly in terms of reliability and latency. Satellite coverage also exists in the villages—such as Dish Network—but, again, reliability and latency can be serious issues (Densford 2018). Weather can also serve as a disrupter for internet connectivity, especially satellite internet (Strawn 2015).

A third hurdle is the anticipated obsolescence of current telesurgery technology, which turns out to be a prohibitive financial consideration. The limited capacities of telesurgery of current technology, such as the da Vinci machine, ensure future machines will continue to increase the quality of robotic care dramatically. Given how likely it is for a new surgical robot that outstrips the da Vinci machine and its peers in the next few years, spending $360 million on machines that will be unable to pay for themselves by the time new, better, and cheaper machines enter the market is an enormous opportunity cost (Densford 2018).

A fourth set of concerns clusters around the fact that, even if villages had telesurgery, then what? How is this technology maintained or serviced? If something breaks, it would be difficult—and expensive—to get it operational again. Even routine maintenance would require something like itinerant technicians; if we have to figure that out anyway, the marginal costs of itinerant providers are lowered. In other words, the costs that would have to go into itinerant technicians—plus the technology itself—could be invested in itinerant care directly. Given the obsolescence concern, the technologies would not last forever regardless, it is far from obvious that investment would pay off, as against the status quo—or even improved—itinerant care.

So, on the one hand, there is great promise for this technology. Perhaps, we are not so far away from robot anesthesiologists or other technological breakthroughs that would remediate some of these worries. In addition to robotics, artificial intelligence is a key technological driver (Lin et al. 2017), perhaps one that could mitigate the connectivity challenges. If the robotics can be offline—or have built in redundancies for latency and other failures—that would abrogate the need for high-speed fiber optics. But, medical artificial intelligence is still in nascent stages, and we do not expect this to be widely available soon. Regardless, there is still the $360 million + bill to be paid.

It is more plausible to retreat from telesurgery and focus on other aspects of telemedicine. For example, face-to-face clinical sessions could take place over Skype—or some related platform. These could give rural Alaskans access to well-trained medical personnel, living in Anchorage (or, really, anywhere—Anchorage might not be cost-effective compared to out-of-state).[22] Those personnel could also issue prescriptions, thus solving one of the obstacles discussed above. Other care delivery, such as mental health counseling, could also be effected remotely. On this model, the offerings in villages would still be fairly rudimentary, with surgeries taking place in either hub communities or, more likely, Anchorage. Another consideration might be the expansion of ethics committees. As noted

[22] Though there may be other structural features inveighing against out-of-state care, such as licensure.

earlier, rural communities often lack such resources (Cook and Hoas 2010). However, with the advent of telemedicine—or even videoconferencing more generally—such resources might well be within the reach of Alaska and other rural areas.

Even this approach has its problems, however. Consider stomach pain: there are a large number of underlying conditions that can explain the symptom, but most are not easily discerned without a physician's being able to feel the patient's abdomen (Kim 2015). Although it faces these sorts of limitations, telemedicine may nevertheless provide a point of entry into on-site healthcare. For example, rural inhabitants can at least get preliminary feedback on whether they should seek care in a more advanced treatment facility. Or, regardless, even if telemedicine is not a panacea, it clearly could make at least incremental gains in non-acute situations.

Conclusions

In the "Size, Population, and (In)Accessibility" section of this paper, we discussed the size and population of Alaska, noting the inherent challenges of providing healthcare to such a low population density; these challenges are further exacerbated by the lack of infrastructure (e.g., roads) that would facilitate delivery. In the "Distributing Healthcare" section, we went on to describe further challenges in healthcare delivery, focusing on high costs and limited staffing. However, we also recognized strides that Alaska has made in this regard, particularly through its participation in WWAMI—a collaborative medical training program across five northwest states. WWAMI not only offers training for Alaska residents, but loan forgiveness incentivizes graduates to return to Alaska, with even greater incentives to practice in rural Alaska.

In the "Health Care in Rural Alaska" section, we pivoted toward a more explicit focus on rural care, noting that many Alaskans live far from substantial medical facilities—and that plane might be the only way to access those facilities. This focus sharpened in the "Alaska's Native Villages" section, where we specifically considered some 140,000 residents who live in Alaska's native villages. These villages have even fewer resources than other rural settings in Alaska, although they are generally linked through hub communities. In the villages, itinerant care still plays a major role as there is neither the funding nor population to staff village-based providers. In the "Justice and Healthcare Delivery" and "Technology and Telemedicine" sections, we considered ways in which the healthcare issues Alaska faces can be addressed by methods of traditional healthcare delivery and how new technology could redress these challenges, particularly through telemedicine. In its current incarnation, though, the prospects for telemedicine may be limited in the villages, specifically because of its reliance on high-speed fiber optics, on-site staffing, and routine repairs or maintenance. However, the future portends significant technological advances, though the associated costs—at least in the short- to mid-term—are likely to remain obstacles.

References

Alaska Department of Commerce, Community, and Economic Development. (2018). Alcohol local option. https://www.commerce.alaska.gov/web/amco/AlcoholLocalOption.aspx. Accessed 2 Oct 2019.

Alaska Department of Fish and Game. (2018). 2018 Preliminary Kuskokwim area salmon season summary. https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.bluesheetsummary. Accessed 2 Oct 2019.

Alaska Department of Health & Social Services. (2013). Detailed causes of death for Alaska. http://dhss.alaska.gov/dph/VitalStats/Documents/stats/death_statistics/detailed_causes_census/frame.html. Accessed 2 Oct 2019.

Alaska Department of Health & Social Services. (2014). Health care in Alaska. http://dhss.alaska.gov/dph/HealthPlanning/Documents/pdf/Health%20Care%20in%20Alaska%20-%202014%20update.pdf. Accessed 2 Oct 2019.

Alaska Department of Health & Social Services. (2018a). SHARP support-for-service. http://dhss.alaska.gov/dph/HealthPlanning/Pages/sharp/default.aspx. Accessed 2 Oct 2019.

Alaska Department of Health & Social Services. (2018b). Trauma system in Alaska. http://dhss.alaska.gov/dph/Emergency/Pages/trauma/default.aspx. Accessed 2 Oct 2019.

Alaska Department of Labor and Workforce Development. (2017). 2017 Population estimates by borough, census area, and economic region. http://live.laborstats.alaska.gov/pop/popestpub.cfm. Accessed 2 Oct 2019.

Alaska Department of Labor & Workforce Developmen. (2019). Alaska Economic Trends July 2019. http://labor.alaska.gov/trends/jul19.pdf. Accessed 6 Oct 2019.

Alaska Division of Public Health Section of Health Planning and Systems Development. (2016). Alaska 2015-2016 primary care needs assessment. http://dhss.alaska.gov/dph/HealthPlanning/Documents/Primary%20Care%20Needs%20Assessment/AlaskaPrimaryCareNeedsAssessment_2015-2016.pdf. Accessed 2 Oct 2019.

Alaska Native Tribal Health Consortium. (2016). Community health aide program certification board newsletter. *Alaska CHAP, Office of Statewide Services* 2.18.

Alaska Native Tribal Health Consortium. (2018). Who we are: Overview. *About Alaska Native Tribal Health Consortium*.

Aleccia, J. (2017, April 6). High-cost Alaska sits in the eye of health care reform storm. *CNN*. http://money.cnn.com/2017/04/06/news/economy/alaska-health-care-reform/index.html. Accessed 2 Oct 2019.

American Association of Nurse Practitioners. (2018). State practice environment. https://www.aanp.org/advocacy/state/state-practice-environment. Accessed 6 Oct 2019.

Arneson, R. (1988). Equality and equal opportunity for welfare. *Philosophical Studies, 56*(1), 77–93.

Arrow, K. (1973). Some ordinalist-utilitarian notes on Rawls's theory of justice. *Journal of Philosophy, 70*(9), 251.

Associated Press. (2018, June 30). King Salmon run on Yukon River well below average so far. *The Seattle Times*. https://www.seattletimes.com/nation-world/apxking-salmon-run-on-yukon-river-well-below-average-so-far/. Accessed 2 Oct 2019.

Barbash, G., & Glied, S. (2010). New technology and health care costs—The case of robot-assisted surgery. *The New England Journal of Medicine, 363*(8), 701–704.

Bethel Family Clinic. (2018). Services. http://www.bethelclinic.org/services/. Accessed 2 Oct 2019.

Cohen, G. (1989). On the currency of egalitarian justice. *Ethics, 99*(4), 906–944.

Cook, A., & Hoas, H. (2010). The national rural bioethics project. University of Montana Health Care Ethics Studies. http://www.umt.edu/bioethics/. Accessed 2 Oct 2019.

Cox, C., Long, M., Semanskee, A., et al. (2016). 2017 Premium changes and insurer participation in the Affordable Care Act's health insurance marketplaces. Henry J. Kaiser Family Foundation. http://www.kff.org/health-reform/issue-brief/2017-premium-changes-and-insurer-participation-in-the-affordable-care-acts-health-insurance-marketplaces/. Accessed 2 Oct 2019.

Daniels, N. (1981). Health care needs and distributive justice. *Philosophy & Public Affairs, 10*(2), 146–179.

Daniels, N. (1985). *Just health care*. New York: Cambridge University Press.

Daniels, N. (2008). *Just health: Meeting health needs fairly*. New York: Cambridge University Press.

Daniels, N. (2017). Justice and access to health care. *Stanford encyclopedia of philosophy*. https://plato.stanford.edu/entries/justice-healthcareaccess/. Accessed 2 Oct 2019.
Davis, J. (2015, August 30). Mount McKinley will again be called Denali. *New York Times*. https://www.nytimes.com/2015/08/31/us/mount-mckinley-will-be-renamed-denali.html. Accessed 2 Oct 2019.
Densford, F. (2018, March 26). Does robotic telesurgery have a future? *Medical Design & Outsourcing*. https://www.medicaldesignandoutsourcing.com/robotic-telesurgery-future-corindus/. Accessed 2 Oct 2019.
Dunbar-Ortiz, R. (2015). *An indigenous peoples' history of the United States (ReVisioning American History)*. Boston: Beacon Press.
Dworkin, R. (1981). What is equality? Part 2: Equality of resources. *Philosophy & Public Affairs, 10*(3), 185–246.
Dworkin, R. (1994). Will Clinton's plan be fair? *New York Times Review of Books, 41*(1), 1–2.
Dworkin, R. (2000). *Sovereign virtue: The theory and practice of equality*. Cambridge, MA: Harvard University Press.
Earl, E. (2017, December 3). Premera returns $25 M to State Reinsurance Program. *Peninsula Clarion*. http://peninsulaclarion.com/news/local/2017-12-03/premera-returns-25m-state-reinsurance-program. Accessed 2 Oct 2019.
Eilperin, J. (2018, January 22). Zinke signs land-swap deal allowing road through Alaska's Izembek wilderness. *Washington Post*. https://www.washingtonpost.com/news/energy-environment/wp/2018/01/22/zinke-to-sign-land-swap-deal-allowing-road-through-alaskas-izembek-wilderness/?utm_term=.6bf8f0fa0c17. Accessed 2 Oct 2019.
Englehardt, H.T., Jr. (1979). Rights to health care: A critical appraisal. *The Journal of Medicine and Philosophy: A Forum for Bioethics and Philosophy of Medicine, 4*(2), 113–117.
Fagan, E., et al. (2015). Family medicine graduate proximity to their site of training: Policy options for improving the distribution of primary care access. *Family Medicine, 47*(2), 124–130.
Flight Stats. (2018a). 7H 3252 Flight tracker. https://www.flightstats.com/v2/flight-tracker/search. Accessed 6 Oct 2019.
Flight Stats. (2018b). 7H 3232 Flight tracker. https://www.flightstats.com/v2/flight-tracker/search. Accessed 6 Oct 2019.
Flight Stats. (2018c). 7H 3298 Flight tracker.
GCI. (2018). Investing in Alaska. https://www.gci.com/business/why-gci/alaska-investment. Accessed 6 Oct 2019.
Gibbard, A. (1982). The prospective Pareto principle and its applicationn to questions of equity of access to health care: A philosophical examination. *Milbank Memorial Fund Quarterly/Health and Society, 60*(3), 399–428.
Haskett, G. (2010). Izembek National Wildlife Refuge, Cold Bay, Alaska. *Federal Register The Daily Journal of the United States Government*. https://www.federalregister.gov/documents/2010/02/24/2010-3642/izembek-national-wildlife-refuge-cold-bay-alaska. Accessed 6 Oct 2019.
Holton, G., Kerr, J., & West, C. (2011). Indigenous peoples and languages of Alaska. University of Alaska Fairbanks. https://www.uaf.edu/anla/collections/map/anlmap.png. Accessed 2 October 2019.
Hoshowsky, R. (2014). The future of telemedicine is here now. *Business Focus Magazine*. https://www.businessinfocusmagazine.com/2014/08/the-future-of-telemedicine-is-here-now/. Accessed 2 Oct 2019.
Innovations Exchange Team. (2013). Telehealth improves access and quality of care for Alaska Natives. *Agency for Healthcare Research and Quality*. https://innovations.ahrq.gov/perspectives/telehealth-improves-access-and-quality-care-alaska-natives. Accessed 2 Oct 2019.
Kaiser Family Foundation. (2014). Health care expenditures per capita by state of residence. https://www.kff.org/other/state-indicator/health-spending-per-capita/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D. Accessed 2 Oct 2019.
Kardish, C. (2014). Missouri's unprecedented push to ease the doctor shortage. *Governing*. http://www.governing.com/topics/health-human-services/gov-missouri-medical-residency-law.html. Accessed 2 October 2019.
Kim, S. (2015). What causes abdominal pain. *Healthline*. https://www.healthline.com/symptom/abdominal-pain. Accessed 2 Oct 2019.
Kokesh, J. A., Ferguson, S., & Patricoski, C. (2004). Telehealth in Alaska: Delivery of health care services from a specialist's perspective. *International Journal of Circumpolar Health, 63*(4), 387–400.

Lin, P., Jenkins, R., & Abney, K. (2017). *Robot ethics 2.0: From autonomous cars to artificial intelligence*. New York: Oxford University Press.

Local Option. (2017). AS §§ 04.11.491.

Lopez, G. (2015). Who uses the most marijuana—And what it means for legalization. *Vox*. https://www.vox.com/2015/3/13/8207577/marijuana-use-education. Accessed 2 Oct 2019.

McDonald, F. (2016). Failure to act on Alaska's healthcare crisis is costly and inexcusable. *Anchorage Daily News*. https://www.adn.com/commentary/article/failure-act-alaskas-healthcare-crisis-inexcusable/2016/01/19/. Accessed 2 Oct 2019.

Nelson, W., Greene, M. A., & West, A. (2010). Rural healthcare ethics: No longer the forgotten quarter. *Cambridge Quarterly of Healthcare Ethics, 19*(4), 510–517.

Nelson, W., Pomeranz, A., Howard, K., et al. (2007). A proposed rural healthcare ethics agenda. *Journal of Medical Ethics, 33*(3), 136–139.

Parlier, A., Gavin, S. L., Thach, S., et al. (2018). The road to rural primary care: A narrative review of factors that help develop, recruit, and retain rural primary care physicians. *Academic Medicine, 93*(1), 130–140.

Pathman, D. T. K., & Ricketts, T., III. (1994). Medical education and the retention of rural physicians. *Health Services Research, 29*(1)*,* 39–58.

Pathman, D., Conrad, T. R., King, T. S., et al. (2008). Medical training debt and service commitments: The rural consequences. *Journal of Rural Health, 16*(3), 264–272.

Peter, E. (2009). Undermining our tribal governments: Stripping of land resources and rights from Alaska native nations. In M. Williams, R. Kirk, & O. Starn (Eds.), *The Alaska native reader: History, culture, politics* (pp. 178–183). Durham: Duke University Press Books.

Rawls, J. (1998). *A theory of justice* (revised ed.). Cambridge, MA: Belknap Press of Harvard University Press.

Schudel, M. (2017). Ralph Regula, congressman who helped protect public lands, dies at 92. *Washington Post*. https://www.washingtonpost.com/local/obituaries/ralph-regula-congressman-who-helped-protect-public-lands-dies-at-92/2017/07/20/e47f9e28-6d6a-11e7-9c15-177740635e83_story.html. Accessed 2 Oct 2019.

Sen, A. (1980). Equality of what? In S. McMurrin (Ed.), *The Tanner lectures on human values* (pp. 197–220). Salt Lake City: University of Utah Press.

Sen, A. (1992). *Inequality reexamined*. Cambridge, MA: Harvard University Press.

Shively, M., Wood, D., Olsho, L., et al. (2008). Evaluation of the rural Alaska alcohol interdiction, investigation, and prosecution program. *Office of Research and Evaluation National Institute of Justice.* https://www.ncjrs.gov/pdffiles1/nij/grants/228189.pdf. Accessed 2 Oct 2019.

Shoffstall-Cone, S., & Williard, M. (2013). Alaska dental health aide program. *International Journal of Circumpolar Health, 72,* 211198.

Sreenivasan, G. (2007). Health care and equality of opportunity. *Hastings Center Report, 37*(2), 21–31.

Stefano, G. (2017). Robotic surgery: Fast forward to telemedicine. *Medical Science Monitor, 23,* 1856.

Strawn, B. (2015). Does weather impact internet connection speeds? *High Speed Internet.com*. https://www.highspeedinternet.com/resources/does-weather-impact-internet-connection-speeds/. Accessed 2 Oct 2019.

Stricker, J. (2017). Alaska Native Regional Corporation 2017 Review. *Alaska Business*. http://www.akbizmag.com/Alaska-Business-Monthly/October-2017/Alaska-Native-Regional-Corporation-2017-Review/. Accessed 2 Oct 2019.

United States Census Bureau. (2010a). American Indians and Alaska Natives. https://www2.census.gov/geo/maps/special/AIANWall2010/AIAN_AK_2010.pdf. Accessed 2 Oct 2019.

United States Census Bureau. (2010b). United States Summary: 2010. https://www.census.gov/programs-surveys/decennial-census/decade.2010.html. Accessed 2 Oct 2019.

United States Census Bureau. (2018). State population totals and components of change: 2010-2017. https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html. Accessed 2 Oct 2019.

United States Department of the Interior. (2013). Izembek National Wildlife Refuge Land Exchange/Road Corridor final environmental impact statement. https://www.federalregister.gov/documents/2013/02/06/2013-02618/final-environmental-impact-statement-izembek-national-wildlife-refuge-proposed-land-exchangeroad. Accessed 2 Oct 2019.

United States Department of the Interior. (2018). Fact sheet. https://www.nps.gov/wrst/learn/photosmultimedia/upload/WRST-Fact-Sheet.pdf. Accessed 2 Oct 2019.

University of Alaska Anchorage. (2018a). WWAMI. https://www.uaa.alaska.edu/academics/college-of-health/departments/wwami/. Acessed 2 Oct 2019.
University of Alaska Anchorage. (2018b). Alaska WWAMI history. https://www.uaa.alaska.edu/academics/college-of-health/departments/wwami/about-wwami/ak-wwami-history.cshtml. Accessed 2 Oct 2019.
University of Washington Medicine. (2018). Trauma, burn, and critical care surgery. https://www.uwsurgery.org/divisions/trauma-and-burn/. Accessed 6 Oct 2019.
U.S. News. (2018). Yukon-Kuskokwim Delta Regional Hospital. https://health.usnews.com/best-hospitals/area/ak/yukon-kuskokwim-delta-regional-hospital-6940040. Accessed 2 Oct 2019.
U.S. Energy Information Administration. (2018). Alaska state profile and energy estimates. https://www.eia.gov/state/?sid=AK#tabs-5. Accessed 6 Oct 2019.
Vincent, C., Hanson, L., & Argueta, C. (2017). *Federal land ownership: Overview and data. Congressional Research Service*. https://fas.org/sgp/crs/misc/R42346.pdf. Accessed 2 Oct 2019.
Walker, B. (2018). *Federal government to distribute $58 million to Alaska reinsurance program in 2018. Press Release No. 18-020.* https://www.commerce.alaska.gov/web/Portals/11/Pub/Headlines/PR%2018-020%20Federal%20government%20to%20distribute%20$58%20million%20to%20Alaska%20Reinsurance%20Program%20in%202018.pdf. Accessed 2 Oct 2019.
Whistler, B. (2012). Alaska oral health plan: 2012-2016. *Alaska Department of Health and Social Services*. http://dhss.alaska.gov/dph/wcfh/Documents/oralhealth/docs/OralHealthPlan2012.pdf. Accessed 2 Oct 2019.
Williams, M., Kirk, R., & Starn, O. (Eds.). (2009). *The Alaska native reader: History, culture, politics*. Durham: Duke University Press Books.