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IN CASE OF EMERGENCY: LOCAL MEDICAL SERVICES AND EMERGENCY AIR
TRANSPORTATION IN SOUTHEAST ALASKA

By

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In Case of Emergency: Local Medical Services and Emergency Air Transport in Southeast Alaska

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Alaska, often referred to as "The Last Frontier", is a vast, geographically diverse and sparsely settled landscape. Although many popular reality shows tend to exaggerate and dramatize life in Alaska, they do point to an important fact: when an emergency occurs, or someone experiences serious health complications, immediate access to sufficient medical services may not be available. Much of the state's population faces barriers to accessing needed medical care due to large distances between communities and limited road networks due to coastal locations or challenging terrain.

Using Penchansky and Thomas's five components of Access Theory (1981), this thesis explores factors that influence access to local medical services and emergency air transportation in Southeast Alaska. Interviews with local health care providers and medevac personnel, field observations, and other qualitative data sources were used to answer the following questions: 1) How does access to health care services vary between rural communities and the regional center in Southeast Alaska? and 2) What role does emergency air transport play in facilitating access to health care services in the Southeastern region?

The study found that within the service hierarchy of the Southeast Alaska medical system, the availability of services, particularly certain specialists, was the biggest factor in access to health care. Also, despite the high cost, medevac services provide an increasingly vital role in the health care system.

Key Words: Access Theory, Alaska, Geographic Isolation, Health Care, Qualitative

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Chapter 1: Introduction

Alaska, often referred to as "The Last Frontier", is a vast geographically diverse landscape covering 665,384 square miles (US Census Bureau 2010). With a population of about 741,000 (2016) the average population density comes out to just 1.1 person per square mile (Parker 2018). Although many popular reality shows tend to exaggerate and dramatize life in Alaska, they do point to an important fact: when an emergency occurs or someone experiences serious health complications, immediate access to sufficient medical services may not be available. Much of the state's population faces barriers to accessing needed medical care due to large distances between communities, diverse landscapes, and limited road networks.

Human right to health not only benefits the individual but also communities at large and relies on individuals having adequate access to medical services. This right to health is set out in Article 12 of the International Covenant on Economic, Social, and Cultural Rights (CESCR), stating that participants agree to "recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health" (United Nations 1976,4). This mandate also tasks participants to insure "The creation of conditions which would assure to all medical service and medical attention in the event of sickness" (United Nations 1976,4). This directive poses challenges in Alaska where connectivity and availability of resources are limited and concentrated in larger communities across the state.

The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity" (World Health Organization 2014,1). By these standards, health is not just

about the condition of the mind and body, but since humans are social creatures this also includes the health of those around them. In rural, geographically isolated areas, Emergency Medical Services (EMS) contributes to overall health by providing reliable transport to outside communities where advanced medical services can be accessed if needed. Due to Alaska's rural status—characterized by its low population density, diverse landscape, and lack of an extensive connected road system—health care access should be perceived as adequate, and comparative to other communities, by all parties involved in providing and receiving services. Due to the complexity of managing a health network over a large and remote area, such as Alaska, standard health network structures struggle to accommodate existing geographic, social, and infrastructural variability. What may work in urban communities such as Anchorage or Juneau may not be applicable to rural communities such as Savoonga, Nakiski, Adak, or Hyder. Therefore, understanding the regional variability of health care services and accessibility to those services is vital in maintaining and improving a health care system that ensures the health of all residents.

This thesis explores factors affecting access to local medical services and emergency air transportation in the region of Southeast Alaska. A combination of interviews with local health care providers, medevac personnel, field observations, and other qualitative data sources sets out to answer the following questions: 1) How does access to health care services vary between rural communities and the regional center in Southeast Alaska? 2) What role does emergency air transport play in facilitating access to health care services in the Southeastern region?

There is limited recent published work on access to medical services in Alaska. In this rapidly evolving health care climate and increasing number of pledges for improving

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health outcomes in the US (American College Health Association n.d.; Alaska Department of Health and Human Services 2017; US Office of Disease Prevention and Health Promotion 2018), current health care access information is important for informing policy makers and health care program managers. Therefore, this research provides insight into the health care system currently in operation in Southeast Alaska. While this thesis focuses on one region, its framework and methodologies could be applied to other regions throughout the state. The results of such a study could provide valuable information regarding access to medical services in Alaska's diverse economic, cultural, and geographic landscapes.

Chapter 2: Southeast Alaska

Chapter 2: Southeast Alaska, will cover a series of brief overviews discussing various characteristics of the region on which this research focuses. The characteristics discussed include: Physical landscape; the wide array of marine and terrestrial flora and fauna; regional transportation networks; economy; and population, demographics, and culture. Understanding the makeup and current infrastructure of the Southeast region is vital when studying access to health care services.

Southeast Alaska, the focus of this thesis, is also known by its nickname the "Panhandle". This temperate rainforest region consists of 33,500 square miles of towering mountains cleaved by glaciated valleys, winding rivers, glacial ice fields, and island networks, sandwiched between the Pacific Ocean and British Columbia, Canada (Figure 1) (Rain Coast Data 2017). Some of the major geographic points of interest include: The Coast Range; Admiralty, Baranof, and Chichagof Island (The ABC islands which are part of the larger Alexander Archipelago); the 17 million acre Tongass National Forest (US Forest Service n.d.), and Glacier Bay National Park. These wild places are home to a diverse ecosystem of terrestrial and aquatic plants and animals. Including but not limited to: Sitka Spruce, Yellow Cedar, Devils Club, Lupine, Moose, Porcupines, Bald Eagles, Humpback Whales, Sea Otter, Halibut, all five species of Salmon (King, Sockeye, Coho, Pink, and Chum), and the largest concentration of Coastal Brown Bear in North America on Admiralty Island (Dihle 2017).

Figure 1. Study Area: Southeast Alaska. Featuring communities, major islands, waterways, and bodies of water. By Kourtney Johnson, Dept. of Geography, University of Montana using ESRI ArcGIS Maps for Adobe Creative Cloud (2018).

Most of the communities in the region are located either on islands or coastal shoreline. Only two towns, Skagway and Haines, are connected to highways that intersect the Alaskan Hwy, which connects Alaska via Canada with the lower 48. Since most of the communities are not connected by road, residents must travel and move goods by air or marine transport.

Living in a large island and coastal region, transportation is an important aspect of life in Southeast Alaska. There are a few different types of transportation upon which residents rely for living and working in the region. For the larger communities, regular jet service is provided by Alaska Airlines. Otherwise transportation is reliant on small plane service and the Alaska Marine Highway ferry system. The ferry system is important because for many rural communities it is the most economical way to transport supplies, resources, and vehicles (Image 1 Appendix). However, increasing cuts to the ferry system budget has had heavy impacts on the frequency of service to these communities.

The ferry system also plays an important role in transporting passengers between communities for work, to visit family, and access services such as grocery and hardware stores and medical services. For example, traveling or part-time medical providers utilize ferry service to travel between medical clinics in various communities. Regional air and marine transport also provide opportunities for economic stimulus. Particularly during the summer months, independent travelers utilize the ferry system and bush plane services to access Glacier National Park and the multitude of hunting and fishing lodges in the region. In Southeast, transportation plays a vital role in transporting people, supplies, resources, and sources of economic stimulus to hard-to-reach places.

The mixed economy of Southeast Alaska includes government, commercial fishing, resource extraction, tourism, and services. The three major classes of workers in the workforce being private (57.1%), government (33.3%), and self-employed (9.2%) (U.S Census Bureau 2017). These numbers are supported by a recent report which states that the top three employers for the region are government, tourism, and commercial fishing (Rain Coast Data 2018). Of these three sectors, although not the largest, tourism is the fastest growing industry in Southeast. Every year, popular Alaskan cruises bring hundreds of thousands of visitors through five communities (Ketchikan, Juneau, Sitka, Skagway, and Icy Strait Point just outside of Hoonah). This does not include the hundreds of workers who relocate to Alaska for seasonal work in the industry. According to the most recent Rain Coast Data *Southeast by the Numbers* report, the industry shows no sign of slowing down as the number of visitors which is predicted to increase 17% between 2018 and 2019 (Rain Coast Data 2018).

Unlike other states in the US, Alaska is split up into boroughs and census areas. In Southeast, approximately 33 communities are organized into seven boroughs, two census areas, and one municipality (Alaska Department of Community and Regional Affairs n.d.; US Census Bureau 2017). With a total population of 72,915 (2017), 75% of the population lives within the three largest communities: Juneau (32,269), Ketchikan (13,754), and Sitka (8,748) (Rain Coast Data 2018). Juneau, the largest community in the region, plays a dual role as both the Southeast regional center and state capitol. The capitol was moved to Juneau in 1959, when Alaska became a state, from Sitka which had served as the administrative center when owned by Russia and during Alaska's territorial days (Bill 2018).

The basic breakdown of demographics in Southeast, according to the 2016 American Community Survey (ACS) estimates are: 66.2% White, 15.6% Alaskan Native, 6.1% Asian, 1.1% Black, 0.5% Hawaiian or Pacific Islander; 9.4% self-identified as two ethnicities (US Census Bureau 2017). Culture plays a large role in everyday community life. Southeast Alaska is the traditional land of the Alaska Native Tlingit, Haida, and Tsimshian people. Local native cultural influences can be seen and observed in many aspects of life throughout Southeast, including art, architecture, ceremony during events, dance groups, the biennial Celebration festival, and many more. Although Alaska was no exception to past mistreatment of its indigenous peoples, it has made attempts to righting those wrongs. A recent landmark event was the passage of House Bill 216 in 2014 into law, which added Alaska Native Languages to the list of official state languages (Smith 2014). The Pilipino and Tongan Samoan communities in Juneau and Norwegian community in Petersburg (Image 2 Appendix) are two additional cultural influences in the region.

Chapter 3: Context for Rural Health and Medical Emergency Transport

In Chapter 3: Context for Rural Health and Medical Emergency Transport, background information regarding rural health care and emergency medical services in the United States and Alaska is discussed. The chapter is divided into five categories: Defining rural and common classification schemes; the structure of rural health care and some of its challenges; Emergency Medical Services system and types of transportation; the Alaska health care system and programs; the structure of Alaska health care services in the Southeast region; and Access Theory characteristics and frameworks.

Rural Health

"Rural" is defined in different ways (Ricketts 2000; Coburn et al. 2007; Gregory 2009; Ratcliffe et al. 2016), yet there is consensus that population size, population density, and proximity to a metropolitan city are core components of rurality. In their article for the American Journal of Public Health, Hart, Larson, and Lishner (2005) identify five common taxonomies for defining rural. Each theme reflects the focus and objectives of the organization or federal agency that designed it. Two of these themes, from the US Department of Agriculture (USDA) and the Office of Management and Budget (OMB), are frequently utilized. The Rural Urban Continuum Codes, developed by the USDA (Figure 2a), categorizes counties into nine classes based on their population size and adjacency to a metropolitan county. The OMB classification categorizes counties into one of three classes (metropolitan, micropolitan, and noncore) based on the urban center population and its economic or commuting relationship to nearby communities (Figure 2b) (Gesler et al. 2006; RTC:Rural 2015; US Census Bureau 2018). Micropolitan

and noncore counties make up the nonmetropolitan US often considered to be rural America.
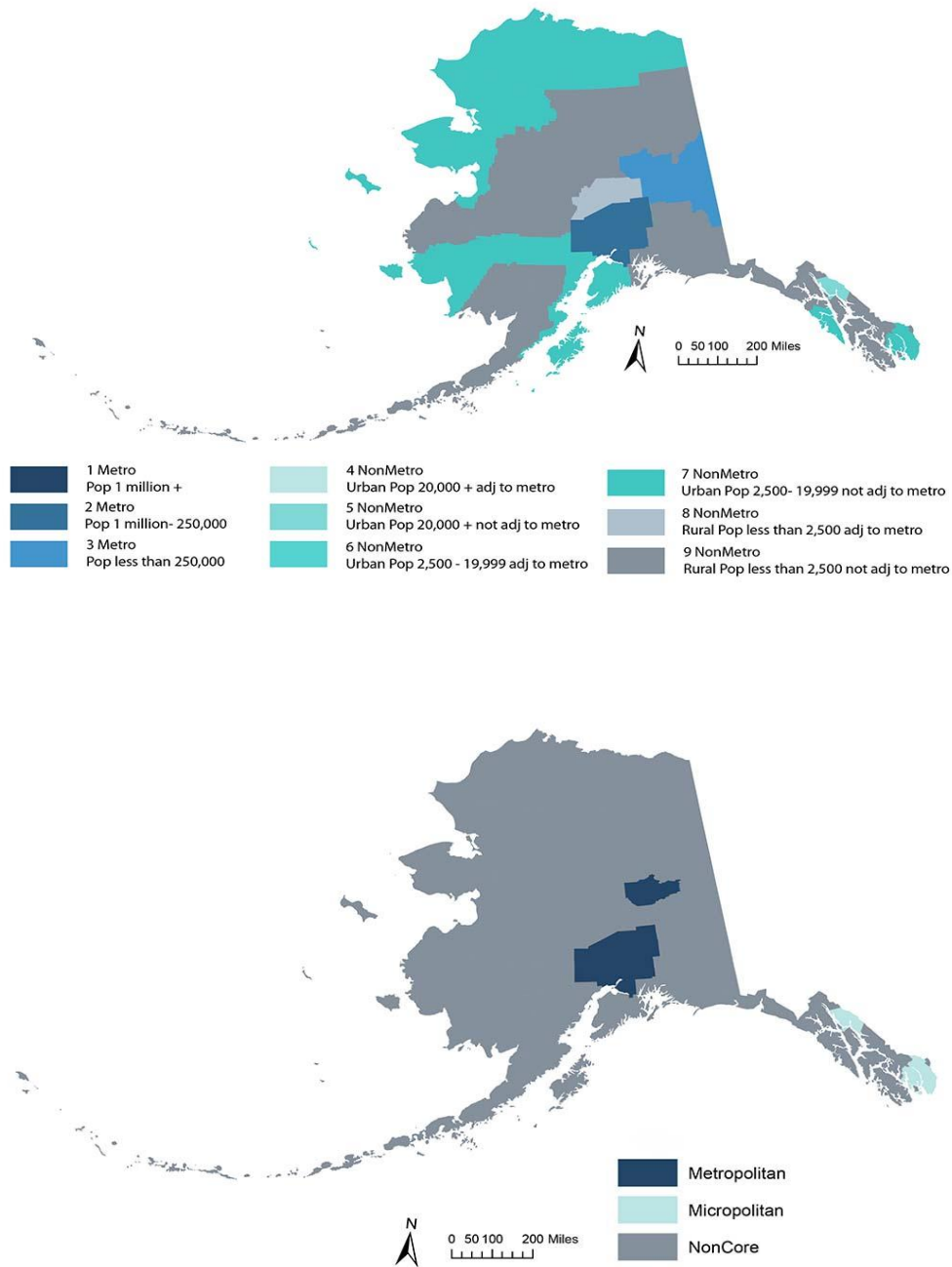

Figure 2 a-b. USDA and OMB Classification Schemes in Alaska. The classification of Alaska based on the USDA Rural-Urban Continuum Codes *top*. Alaska classified according to the OMB Codes *bottom*. By Kourtney Johnson, Dept. of Geography, University of Montana.

Based on the 2013 OMB codes, 72% of the US land area is classified as rural (Cromartie 2017). According to the latest census, approximately 19-20% of the US population live and work in these rural areas (Ratcliffe et al. 2016). Regrettably, rural areas of the US have some of the highest rates of chronic illness and frequency of emergency room visits (Ricketts 2000; Jones, López-Carr, and Dalal 2011; Mueller et al. 2016). Studies show that rural areas experience 27-35% higher rates of hospitalization than urban areas (Ricketts 2000; Staloch 2015). However, a review by Starfield, Shi, and Macinko (2005) verifies that access to medical care, particularly primary care, result in better health outcomes. This would suggest that by increasing access to medical services in rural areas, rates of chronic illness and hospitalization would decrease.

There are multiple types of health care facilities in rural areas. Critical Access Hospitals (CAHs) provide a majority of medical services in rural areas; relying heavily on public insurance reimbursements for their operational budget (Staloch 2015). Federally Qualified Health Centers (FQHCs) provide primary care to those in the most isolated areas of the country (Staloch 2015). Rural Health Clinics (RHCs) are located in rural provider shortage areas and receive at cost reimbursement for Medicaid and Medicare insured patients (The Rural Health Information Hub 2015; Richards et al. 2016). At CAHs and FQHCs costs incurred from emergency services are not covered by Medicaid or Medicare (Staloch 2015). Therefore, the services must either be paid out of pocket by the patient or written off by the hospital (Staloch 2015). Although RHCs have had some success in increasing primary care provider options, this does not assure that the clinic will provide emergency services (The Rural Health Information Hub 2015; Richards et al. 2016). Therefore, despite the vital services that emergency departments

provide, these services tend to be located large distances apart and in overall short supply in rural areas.

Geographic isolation and distance between physicians is a serious concern when discussing rural health care. Due to declining rural populations, changes in public insurance, and the shrinking availability of resources, hospitals in rural regional centers have been forced to scale back their services or close their doors altogether (Ricketts 2000, 2016; Staloch 2015; Kaufman et al. 2016). This decline in health services not only affects health care access for rural residents but impacts the local economy as well. For many moderate sized rural communities, the local economy is reliant on local government, the service sector, and health care to provide jobs and economic stimulus (Ricketts 2016). Limiting health services also affects those in surrounding areas who must travel further to obtain primary and specialized health services.

Limited funding from the government acts as a barrier to providing quality health care. Numerous people living in rural areas experience higher levels of poverty, often relying on Medicaid or Medicare for health insurance coverage. Rural hospitals, whose patient base is largely made up of this population, rely heavily on government public assistance refunds to maintain operations and cover treatment for those without any form of insurance. Although recent changes in US health care have benefited rural areas, increasing geographic isolation and cost of providing services contribute to a persistent divide between rural and urban health care (Ricketts 2000, 2016).

Another challenge faced by many rural health care facilities are chronic staffing shortages. With less than 20% of the population living in rural areas, only a fraction of medical providers work in rural areas (Ricketts 2000). In the 1970's, training programs

and levels of certification such as Nurse Practitioners (NP) and Physician Assistants (PA) were created to address the shortage of health care professionals (Ricketts 2000; Balcazar et al. 2011). To help elevate the shortages in rural areas, Community Health Workers (CHWs) training programs were encouraged due to their connections and vested interest in their communities (American Public Health Association 2009). CHWs often provide basic primary care, chronic illness management, preventative care services, and health education in areas underserved by the larger public health system (Balcazar et al. 2011; Najafizada et al. 2015; Kim et al. 2016; Landers and Levinson 2016). Despite the increase in medical positions such as PAs and CHWs, many rural counties in the United States are identified as insufficiently medically staffed (Staloch 2015; McGrail et al. 2017). Several studies have identified contributing factors which include: a lack of appeal of rural areas to health care professionals, large distances between hospitals, amount of resources available, delay in up-to-date medical advances, and a decrease in physicians with connections to rural areas (Hart et al. 2002; McGrail et al. 2017).

Emergency Medical Services (EMS)

In rural areas emergency medical services (EMS) transportation provides a vital role in connecting rural and remote areas with higher level medical services in urban communities. At its core, the EMS field is the "intersection between public health, public safety, and healthcare" (Mears et al. 2010,85), and covers a wide variety of services from ambulance transport to natural disaster response. This broad spectrum of services makes assigning EMS to any one regulatory or administrative body a difficult task. As a result, the federal government is responsible for EMS regulations and monitoring through the National Highway Traffic and Safety Administration (NHTSA). However, the everyday operations and administration duties are assigned to various local and state departments.

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EMS transportation can take the form of ground ambulances or air transportation, also known as air medevac. In most emergency situations ambulances will be used to transport patients. However, in instances where access to the patient is limited and the injuries are time sensitive, air medevac (helicopter, fixed wind, or jet) will be used to reach, stabilize, and transport the patient (von Recklinghausen 2011). Emergency transportation medical personnel vary depending on the EMS program and mode of transportation. Typically, ground vehicles are staffed by Emergency Medical Technician (EMT) Paramedics or, as is more common in rural areas, an Emergency Medical Technician (EMT). EMT Paramedics receive over 1000+ hours (1200-1800 hours) of training, qualifying them to perform complex emergency procedures (UCLA Center for Prehospital Care n.d.). While EMT personnel do not receive the same amount of extensive training (120-150 training hours), EMTs do have basic emergency medical training and can address a wide range of external medical issues (UCLA Center for Prehospital Care n.d.). Due to the generally more complex medical conditions of patients, air medevac transports are staffed by either EMT Paramedics or flight nurses (von Recklinghausen 2011; Artuso 2012).

Providing Health Care in Alaska

Like rural areas in the contiguous United States, Alaskan health care and emergency services must deal with several barriers and challenges. These include: social barriers, high rates of chronic illness, large distances between medical facilities, and lack of official medical networks (Arcury et al. 2005; Brems et al. 2006; Johnson et al. 2006; Brundisini et al. 2013). Brems et al. (2006) identified limited resources, minimal professional-to-professional interaction, and the effects of living in small, geographically isolated communities as barriers, particularly in rural Alaska. Such barriers are major

issues when, like in other rural areas, there are high rates of chronic illness, depression, and suicide (Driscoll et al. 2010). The 2018 *Chronic Disease in Alaska* report, put out by the Alaska Section of Chronic Disease Prevention and Health Promotion (2017), lists cancer, diabetes, and heart disease among some of the most prevalent causes of chronic illness and death in the state. Additionally, the isolated nature of the state and its lack of an extensive connecting road networks serve as barriers to accessing medical services in other communities. Lastly, while medical service networks in the US health care system are common, that is not the case in Alaska. As the Alaska Health Care Commission notes:

> In Alaska, no 'managed care organizations' exist in the private sector, and formal provider networks are lacking. However informal referral patterns, and 'panels' of preferred providers associated with a variety of insurance programs, result in some structured relationships, and some facilities and groups are affiliated or jointly managed (Alaska Health Care Commission 2010, A5).

In the absence of formal organization, Alaskan medical providers manage this disconnect by coming together and forming their own networks through social and professional connections.

Health Care System

The Alaska health care system is complex and includes a wide variety of provider types and facilities to accommodate diverse climatic and geographic landscapes. To receive medical services, there are three different avenues for accessing health care: private practitioners, Alaska Native health care through the Alaska Native Tribal Health Consortium (ANTHC), and the military, which includes Veteran Affairs (VA) and the US Coast Guard (USCG) (Alaska Health Care Commission 2010). Each of the aforementioned operate their own networks of offices, clinics, and hospitals. While each of these health care avenues provide services to a specific population, there are various

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programs and exceptions in place to accommodate those who may qualify for multiple systems through the Alaska Federal Health Care Partnership (AFHCP) (Alaska Health Care Commission 2010).

A fourth network of state public health clinics and nursing stations provide what is being defined in this research as "basic" care. These basic health services include: immunizations, family planning, a variety of pregnancy services and early child development exams, STI/HIV testing and services, and promoting healthy lifestyle habits (Short 1993; Alaska Division of Public Health 2018).

Originally established in the 1970's, clinics are mandated to continue efforts against persistent Tuberculosis (TB) infections, provide preventative testing, and some family services (Short 1993). Alaska state public health clinics are arranged into four regions: South Central, Southeast, Frontier, and Grantees (Arctic locations which are funded through state grants) (Alaska Division of Public Health 2017). Within these regions there are 17 public health clinics and dozens of nursing stations that provide the above services to almost 300 remote communities and villages (Alaska Division of Public Health 2017).

In this increasingly digital age, the utilization of telemedicine as a tool to reach rural areas is on the rise, and Alaska is no exception. According to the appendix section on telehealth in the most recent Alaska Commission on Health Care report (2010), the Alaska Federal Health Care Access Network (AFHCAN) oversees 248 telehealth locations across Alaska's various health systems. This network operates and supports two telehealth formats. First, the system includes a "store-and-forward" format that sends the health case file digitally to an outside provider who then reviews the case and responds

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with recommendations. A second telemedicine format consist of a video teleconferencing system, providing face-to-face interactions between the patient, or a local provider, and a provider of higher certification of specialization, located in other communities (Alaska Health Care Commission 2010).

Health Care Provider Shortage Areas (HPSAs)

Like other rural areas in the US, Alaska contains Health Care Provider Shortage Areas (HPSAs). HPSAs are counties where there are fewer medical providers for the population than is deemed appropriate. Shortage areas can be categorized by four criteria: 1) provider type (Primary Care, Dental, and Mental); 2) geographic area; 3) facility type; and 4) population group (U.S Health Resources & Services Administration 2016a). The Alaska Community Health Aide Program (CHAP) was developed to help address these shortage areas. This program provides medical training to locals who can then return to their communities and provide services. Currently, there are "approximately 550 Community Health Aides/Practitioners (CHA/Ps) in over 170 rural Alaska villages" (Alaska Community Health Aide Program n.d.). The clinic in Savoonga on St. Laurence Island is an example where this program has been a great success. Currently the village has seven community health aids that provide medical services to their community, and utilize telemedicine technology to provide general services and receive emergency event guidance from doctors on the mainland (Demer 2017). Programs, such as CHAP, act as an example of suitable alternatives to traditional health care structures in regions where trust and understanding of the local culture is an important part of implementing effective medical services and treatments.

The Cost of Medical Care

Residing in Alaska comes with several challenges chief among these are the high costs of living, particularly heath care costs which have consistently ranked Alaska in the top three most expensive states to receive care in (Groh 2017). According the Alaska Health Care Commission (2011) report on *Findings on Health Care Costs, Pricing and Reimbursement* there are several factors that contribute to high medical costs in Alaska including: the cost of insurance, the challenge to cover the cost of public assistance patients, the financial burden of traveling practitioners, and the role of providers in setting service prices. Since the program expansion in 2015, Medicaid in Alaska has faced significant problems. Challenges with the state budget, declining reimbursement rates, and the increased number of new enrollees have contributed to the difficulties. Recent state legislative discussions have considered the potential for increasing numbers of providers refusing to take Medicaid patients, and have debated the need for additional requirements for receiving Medicaid (Brooks 2018; Kitchenman 2018a, 2018b).

Emergency Medical Services in Alaska

Due to the large number of island communities and lack of connecting road networks, air medevac, in particular, is an essential part of emergency medical services (EMS) throughout Alaska. While there is ground EMS transport in many larger communities, air medevac is often the only form of transportation available between communities in an emergency medical situation. There is no one air medevac provider for the state. Instead, the system allows for flexibility for certification of emergency responders which include private medevac companies, the US Coast Guard, military, and private pilots (Artuso 2012). All responders operate a range of aircraft to access Alaska's challenging landscapes. These include fixed wing bush planes, helicopters, float planes,

and small jets. In Alaska there are seven programs which serve as operational managers for on the ground EMS services (Alaska Health Care Commission 2010). The Alaska Department of Public Health and the Alaska Council on EMS provides EMS training and certification (Alaska Health Care Commission 2010).

Health Care in Southeast Alaska

All four of Alaska's health networks—private practitioners, Alaska Native health care, military, and state public health clinics —operate in the Southeast region (Figure 3). Private practices vary in number and structure (stand alone or group practices) between communities. There are hospitals of varying capacities in Juneau, Sitka, Petersburg, and Ketchikan. The regional hospital for Southeast is a level IV trauma facility in Juneau. The native health care system is run by the Southeast Alaska Regional Health Consortium (SEARHC), with clinics throughout Southeast Alaska, a hospital in Sitka, and a hospital currently in progress in Wrangell (SEARHC 2018). Three clinics in Sitka, Juneau, and Ketchikan provide services for the US Coast Guard (Alaska Health Care Commission 2010). State public health clinics are located in Juneau, Sitka, Petersburg, Wrangell, Craig, and Ketchikan with nursing stations in twenty-five other Southeast communities (Alaska Division of Public Health 2017). Finally, while the telehealth network tends to be more concentrated in other parts of the state, one telehealth network, the Alaska Rural Telehealth Network (ARTN), has three of eleven sites in the Southeast region located in Petersburg, Wrangell, and Sitka (Alaska Health Care Commission 2010). Overall, Southeast Alaska residents receive medical services through complex web of regional providers.

Figure 3: Medical Service Network Locations. Map of Southeast medical services including hospitals, State public health clinics and nursing station, SEARHC clinics and hospitals, US Coast Guard health clinics, and communities that are part of a telehealth network. By Kourtney Johnson, Dept. of Geography, University of Montana using ESRI ArcGIS Maps for Adobe Creative Cloud (2018).

As common in service delivery systems, health care services in Southeast Alaska follow a hierarchy. This hierarchy ranges from basic and primary care which is available in many smaller communities to more advance care options offered by hospitals in larger towns. Juneau, the largest regional city and state capitol, is at the top of both the population and service hierarchies in Southeast Alaska. Other places with intermediate medical services include Sitka, Petersburg, Ketchikan, and Craig. This relationship between population and service hierarchies aligns well with the Central Place system proposed by Christaller (1966). Christallers's Central Place Theory suggests that the size of settlements follows a hierarchy, from small towns to larger urban centers, and that the availability of services corresponds to that hierarchy. The number of higher level services increases as places are higher positioned on the urban hierarchy. Central Place Theory further implies that with increasing distance from urban centers, geographic access to a broader array and higher level of services is diminished.

Similar to other parts of the state, Southeast has several health care provider shortages, both in local and regional service centers. The highest provider shortage is for mental health providers followed by primary care providers and dentists (US Health Resources & Services Administration 2018). Patients in need of medical services that are not available in their community need to draw on and travel to health care facilities further up the central place hierarchy. This often means required travel to Sitka, Juneau, or to cities outside Southeast Alaska, typically Anchorage or Seattle. As mentioned previously, challenges of Southeast Alaska's landscape require air and marine transport methods for accessing health services in other communities, adding to the overall cost of

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health care in terms of travel costs and time. In medical emergencies, where a timely response is crucial, patients rely on medevac services. It is noteworthy, that the number of medevacs flown out of Juneau from Bartlett Regional Hospital has increased in recent years (Kellar 2017). This increase is evidence to the essential and growing role medevac services play in health care delivery for the people of Southeast Alaska.

Theory of Access

Access to health care services is a major theme throughout public health research. Topics range from access to primary care to the availability of mental health services, obstetrics resources, and qualified personnel (Ricketts 2000, 2016; Harris, Harris, and Roland 2004; Rutherford, Mulholland, and Hill 2010; Campbell and Salisbury 2015; Saurman, Kirby, and Lyle 2015; McKay and Overberg 2017). However, there is a lack of consensus on both a standard definition and methodology for defining and measuring "access" (Shengelia et al. 2005; Karikari-Martin 2010).

Researchers have developed a variety of access models in an effort to create a standard framework. These models vary in broad or narrow definitions of access and differ in how many factors are considered for measurement. Many of the models explore how services are utilized and what factors spatially and aspatially influence an individual's interaction with health services (Penchansky and Thomas 1981; Khan and Bhardwaj 1994; Karikari-Martin 2010; Terry et al. 2013; Ricketts 2016).

The commonly implemented Anderson Behavior Health Model combines dozens of factors into four categories: Health Policy, Health Care System Structure, Utilization of Services, and Patient Satisfaction (Aday and Andersen 1974; Davidson et al. 2004; Ricketts and Goldsmith 2005). The goal of this model is to discover how policy,

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institutional structure, community, and individuals influence health care access (Karikari-Martin 2010).

Roy Penchansky and J. William Thomas's (1981) Theory of Access offers another approach to health care access by focusing on measures of patient satisfaction, utilization patterns, and provider characteristics (Ricketts and Goldsmith 2005; Karikari-Martin 2010). Penchansky and Thomas define access as " 'the degree of fit' between an individual and a service" (Penchansky and Thomas 1981,128). The framework is structured around five major components that influence a patient's ability and choice to enter the health care system. These categories are Accessibility, Availability, Acceptability, Affordability, and Accommodation (Penchansky and Thomas 1981; Saurman 2016) (Table 1). In previous research, data were gathered from individuals on how these five categories influenced their health care experience, with a rating system usually employing a Likert scale. This type of data collection can be beneficial for examining how access varies for different sub-populations such as persons with disabilities, those suffering from chronic illness, and minority groups (Karikari-Martin 2010).

Table 1: Five components of Penchansky & Thomas's Access Theory (1981)

Component of Access	Definition
Accessibility	An accessible service is within reasonable proximity to the consumer in terms of time and distance
Availability	An available service has sufficient services and resources to meet the volume and needs of the consumers and communities served.
Acceptability	An acceptable service responds to the attitude of the provider and the consumer regarding characteristics of the service and social or cultural concerns. For instance, a patient's desire to see a medical provider who speaks the same language and share the same culture may determine whether a service is acceptable or not.
Affordability	Affordable services examine the direct costs for both the service provider and the consumer.
Accommodation (Adequacy)	An adequate service is well organized to accept clients, and clients are able to use the services. Considerations of adequacy include hours of operation (after-hour services), referral or appointment systems, and facility structures (wheelchair access).

Source: Adopted from Saurman 2016, table 1

Penchansky and Thomas's theory has been used as the basis for defining Health Professional Shortage Areas (HPSAs) and Medically Underserved Areas (MUAs) (Ricketts and Goldsmith 2005). HPSAs classify provider shortages by geography, population group, and public facility type (US Health Resources & Services Administration 2016a). MUAs are "areas or populations… [that have] too few primary care providers, high infant mortality, high poverty or a high elderly population" (US Health Resources & Services Administration 2016b). Southeast Alaska is one such area with shortages of health care professionals and medically underserved areas. Given that,

Penchansky and Thomas's theory holds promise for being a useful structural framework for this thesis.

As the purpose of this study is to improve insight on factors affecting health care utilization throughout Southeast Alaska, Penchansky and Thomas' approach to access can help in gaining a better understanding of factors that affect patients' abilities to access health services, including air medevac in this region.

Chapter 4: Methods and Data Sources

In Chapter 4: Methods and Data Sources, the data collection and analysis process is discussed. The chapter is broken into four sections: the development of the questionnaire guide; the recruitment process for participants and some of the challenges faced; the data collection of interviews and other qualitative data sources; and the process used for coding the collected data.

Interviews and Questionnaire Development

A mix of structured and unstructured interview questions were conducted, mostyly by telephone with local health care providers and medevac personnel. These groups of people were chosen due to their firsthand knowledge of their local community, local health care services, and the regional air medevac system. Although each type of health care professional regularly interacted with the health care system, they did so from different perspectives and capacities. The data collected revealed aspects that affected community members' ability to access and utilize local medical services and emergency medical air transport. Interview questions were broadly based on Penchansky and Thomas's five components of access (Accessibility, Availability, Acceptability, Affordability, and Accommodation).

Interview questions were broken up into five sections: attributes of interview participants, what local health services were available, perceptions on local health care utilization, air medevac systems, and additional comments the interviewee had that were not directly addressed earlier in the interview. Questions relating to available services, perceptions on utilization, and air medevac were chosen to align with the five components of Penchansky and Thomas's access theory.

An early version of the interview guide consisted of eighteen questions. However, feedback from pilot interviews revealed that the time required for the interview would be too long for some interviewees, who may be responding at work, during a lunch break, after work, or otherwise be operating under a time constraint. The question guide was modified by eliminating some of the original questions from the guide. This resulted in an interview guide that allowed for more flexibility in the time required and formality of the interview while still addressing all the components (Table 2). For example, if a participant had more time available the interview tended to be more conversational. While on the other hand if the participant was short on time, a more direct Q&A structure allowed for time to be used efficiently. Due to the involvement of human subjects in the research all questions and the overall research project were approved by the Institutional Review Board at the University of Montana (IRB case #118-17).

Table 2: Final Interview Question Guide

Topic		Question
Attributes	Spatial	What community do you live/work in?
	Age	What is your age? (20-30, 31-40, 41-50, 51-60, >60)
	Experience	How long have you been involved in the medical field or Emergency Medical Services? (<5 years, 5-10 years, 10-20 years, 20-30 years, < 30 years)
	Job Perspective	What is your current position title?
	Experience	How long have you been in your current position?
Service	Availability	What kinds of medical services are available in your community?
	Accommodation	Are there after-hours medical services available?
	Accessibility	In the instance that a patient needs to be transferred to another medical facility, what can you tell me about the reasons motivating the transfer (accident, chronic illness, require additional medical services, other)? Also, what can you tell me about where patients are transferred to (ex. Nearby community, Anchorage, other)?
Perceptions	Acceptability	In your experience, what factors influence resident's decision on where they utilize medical services (ex. Local community clinic vs. flying and visiting medical facilities in another community)?
	Availability	If they cannot receive the needed medical assistance locally, how far are patients willing to travel? (ex: nearby community, Anchorage, other)
	Availability	Based on your knowledge, in the event of a patient needing emergency medevac transport what is the process for dispatching aircraft?
Air Medevac	Affordability	Based on your knowledge, what is the cost and most common billing procedure for an emergency medevac?
	Availability	In your experience, on average how many medical emergency flights are made a month?
	Accessibility	In your experience, what are some of the challenges that medevac flights face when operating in SE Alaska?
Final Thoughts		Is there anything else you would like to mention about utilization of local health services, or air medevac that was not addressed by the previous questions?

Recruitment

When conducting qualitative, interview-based research, recruiting participants is a crucial component. The ability to recruit interview participants played a major role in conducting this research. For this thesis, the study initially was to take place further north in the Nome Census Region. Unfortunately, the inability to gain participants resulted in the need to change study areas. Southeast Alaska was chosen as the new study area for its ability to enable the researcher to utilize personal existing connections in the medical field to begin recruiting participants. Initial personal contacts provided help in gaining access to their medical social groups and offices for other potential participants. Applying the snowball sampling method in Juneau, contact was established with multiple initial participants who then provided references for other potentially interested parties. This sampling method was chosen because it allows for "recruiting one or more members of isolated or hard- to- reach population and asking them to refer the researcher to other members of that group" (Padgett 2011,73). To increase participation in the smaller communities the State of Alaska website was used to identify local medical health services and emergency service providers. The Southeast Alaska Regional Health Consortium (SEARHC) website was also used to identify potential participants who practiced general medicine or had emergency medicine experience.

Overall, twelve interviews were conducted out of twenty-two attempted contacts. Specifics regarding attempts and successes in recruiting are as follows: Six initial contacts in Juneau were made, and successfully recruited, based on personal connections. From that pool, nine potential participants from both Juneau and rural communities were recommended resulting in four additional interview participants in Juneau. Drawing on

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contact information from State of Alaska and SEARHC websites, seven emails and phone calls to rural community health services and medevac companies resulted in two additional interviews from providers in Skagway. At the conclusion of this study, ten interviews were collected from Juneau and two from Skagway. Interviewed participants worked in a wide range of provider roles including physician, multiple levels of nursing certification, medical director, and medevac pilot. On average, interviewees were over fifty years of age and have been in the medical field for over thirty years with over twenty years in their current position. Some of the Juneau participants had lived in rural communities of Alaska, worked in rural medicine and EMS, and had experience as medevac flight nurses, therefore having an understanding of health care in rural Alaska.

Data Collection
Interviews

Of twelve responses from participants, eight were conducted by telephone. Four participants chose to submit written interview responses. Prior to engaging in the phone interview questions, an explanation was given about the purpose of the research, how the interview would proceed, and how the data collected would be used. For the written responses the same information was included with a copy of the interview questions. Lastly, for audio recordings, permission to record the interview for transcription purposes was requested.

The phone interviews lasted 15-30 minutes and were recorded on two different audio recording devices. One was a call recording application on the phone being used, the other being a laptop recording software. This was to ensure that there were two copies of the interview to reduce the risk of recording malfunction. Nonetheless, the recording of one interview, from a Skagway respondent, failed. As a result, the participant's

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responses were paraphrased from interviewer's recollection and were later supported by the responses from the other Skagway interview.

Other Data Sources

In addition to interviews with medical providers and medevac personnel, field observations, and other qualitative data sources were utilized to provide additional context to interview responses. In August 2018, during a three-week visit to Alaska, field observations were recorded in writing and visual imagery were taken of the landscape and transportation methods in Southeast Alaska. During this visit, observations were made, essentially as "windshield tours", involving Juneau and three daytrips to four rural Southeast communities outside of Juneau. The day trips were taken to observe marine transportation routes, infrastructure, and other demographic and geographic characteristics. Communities sought out for these day trips were chosen for their varying population sizes, geographic location, and differing location on the rural Alaska geographic hierarchy. The Alaska State Marine Highway was chosen for two of the day trips for its important role in connecting the many coastal geographically isolated communities in the region, while a catamaran was used for an additional day trip.

The day trips using the Alaska State Marine Highway were taken on the shuttle ferry M/V LeConte. Rural communities visited included 1) Gustavus, and 2) Tenakee Springs and Angoon (Image 3 Appendix). The catamaran trip went from Juneau to Icy Strait Point. Icy Strait Point was chosen for two reasons: for its growing role in regional tourism as an increasingly popular cruise ship stop, and for its proximity to the rural community of Hoonah.

Online sources such as state, local, and agency websites were used to gain a general idea of what medical services were available in rural communities where no

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interviews were collected. Finally, personal lived experience of living and traveling in Southeast Alaska provided additional knowledge of geographic, cultural, lifestyle, and transportation characteristics of the region.

Data Processing and Coding

Following common qualitative methods (Padgett 2011), audio recordings of interviews were transcribed using NCH Express Scribe Transcription software and transcription pedal. Written interview responses were copied into new word documents formatted to match the audio recording transcriptions.

The transcriptions were then imported into the NVivo 10 (2014) software. NVivo is a software used in qualitative research allowing the researcher to organize qualitative data by identifying and assigning themes to specific segments of transcripts. The initial round of coding matched each response with the corresponding interview guide category. Additional coding was required due to several interview responses relating to multiple categories, revealing several categorical subthemes. After multiple rounds of code checking several reports were created to determine common themes within and between the different access theory and medevac components.

Chapter 5: Results and Discussion

In Chapter 5: Results and Discussion, the analysis of data reveals multiple themes within and outside of the access theory framework. To convey findings from interviews and other data sources, this chapter is organized into three sections: An overview of results; Themes from participant responses for each component of the Access Theory framework; and factors that affect emergency air medevac services. These themes act as pieces of a puzzle that provide a dynamic understanding of access to medical services and air medevac in Southeast Alaska.

Overview

Penchansky and Thomas' access framework proved useful not only in developing the interview guide but also throughout the analysis process. By utilizing the five categories of the framework, a template was created for the initial coding. The use of a framework to guide the coding process helped to identify which themes were the most prominent and which areas required additional in-depth analysis. The two most commonly referenced question topics were related to the themes Availability and Medevac. The frequency of access theory categories were as follows: Availability (102 references, 5,656 word count), Medevac (73 references, 5,406 word count), Accessibility (37 references, 2,364 word count), Accommodation (36 references, 2,671 word count), Affordability (33 references, 2,078 word count), and Acceptability (14 references, 709 word count). Additional field observations lent support to many of these themes.

Access Theory Framework
Availability

In rural Alaska, locally available medical services vary greatly between communities (Image 4 Appendix), as interviews revealed. Respondents also spoke to the

lack of available services and the need to travel for health care. The spectrum of available services ranges from small villages having a state-run public health nursing station, which provides basic care, to Sitka where the availability of medical providers and resources are second to Juneau. Still, for many living in rural towns, to receive care for complications resulting from chronic illness or severe trauma, the patient must travel to a community that is equipped with the level of medical care needed. As part of the interviews, participants were asked to describe what kind of medical services were available in their community. According to interview responses, in Skagway medical services are provided by clinic and traveling providers as well as contract services. The local clinic offers primary and urgent care, x-ray and ultrasound services, a limited dispensary, and has the capability to run some lab procedures. Contract personnel provide Occupational Therapy (OT) and Acupuncture services. Lastly, dentistry and mental health services are available through traveling providers on a quarterly basis. In the case of an emergency outside of clinic hours, there is a 24-hour on call nurse.

As to be expected of an urban community, interviewees reported that Juneau has a wide variety of available services including: private practice offices; a state public health clinic; Veteran Affairs (VA) clinic; US Coast Guard clinic; mental health services through the Juneau Alliance for Mental Health, Inc (JAMHI); Alaska Native care available through SEARHC; and Bartlett Regional Hospital. According to participants, these clinics and organizations provide a variety of services including: Primary care, pediatrics, internal medicine, ophthalmology, dentistry, chiropractic care, obstetrics-gynecology, naturopathy, psychiatry, radiation oncology, infusion services, some substance abuse rehab, physical therapy, general and orthopedic surgery, emergency

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services, and long-term care. This wide variety of available services was noted by a local nurse interviewed saying,

> "It's pretty amazing that Juneau has the care that it does. For a town of 33,000 I think it's pretty amazing all the doctors and specialists we have here and all the primary care people we have here. It's a good group… They do really good work and take really good care of people."

Despite the broad range of services available in Juneau, there were several services that were noted to be lacking. Based on interview responses, these services could be categorize into three topics: 1) a lack of certain specialists, 2) limited medical resources, and 3) lack of some specialized facilities. First, the lack of common specialists such as a permanent cardiologist and neurologist means that a host of procedures including angiograms, stents, and specialized surgeries are not available to patients and require the patient to travel to destinations outside of Southeast Alaska. Second, despite the regional hospital being in Juneau, there are some resources like blood platelets that are not kept on hand and require twenty-four hours to acquire. In some cases, a patient may not be able to wait that long and must be flown out by medevac. Lastly, specialized facilities such as neonatal intensive care units (NICU) are not available in Juneau. The lack of specialty personnel, skills, resources, and facilities all contribute to the most situations requiring emergency medevac.

It is worth mentioning that Alaska Natives can receive medical services from either the Native or Non-Native health care systems. The Southeast Alaska Regional Health Consortium (SEARHC) provides medical services to Alaska Natives throughout Southeast. SEARHC's network includes 20 clinics in communities and native villages, and a hospital in Sitka and soon in Wrangell (Leffler 2018). Providers at these clinics may work as full-time staff, traveling staff, or have their own independent practice but

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travel to provide services in SEARHC locations. In the case of an air medevac, the patient may be sent to the SEARHC hospital in Sitka versus Juneau. One provider interviewed suggested that when operating within the SEARCH system, Sitka may be chosen over Juneau as a preferred destination for medevacs, "I believe SEARHC may send many of their patients by plane to their hospital in Sitka to contain costs within their system."

Acceptability

Acceptability relates to a patients willingness to see a provider based on several factors including the perceived knowledge and skill of a provider, or relatable characteristics such as gender, culture, or language (Penchansky and Thomas 1981; Saurman 2016). As previously mentioned, available medical services, and therefore choice of provider, varies between communities. For example, if only one provider is present in a rural community and a patient wished to see someone else, the patient would have to travel to another community. In contrast, while some individuals do choose to travel outside of Southeast Alaska for medical treatment, medical providers interviewed stated that, in Juneau, seeing a local provider is perceived by many patients as adequate or acceptable.

The general acceptability of local providers in Juneau, can likely be contributed to a wider selection of providers and the extensive knowledge of general practitioners. General Practitioners (GPs) throughout the Southeast region tend to have a wider variety of skill and experiences compared to GPs in urban communities. One interviewee discussed the differences between their experiences, in providing medical services in Southeast Alaska, compared to their colleagues located in the lower 48. "…my friends that live down south are always like in awe of our system up here, and they're always

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floored with how much primary care does up here, you know. Our primary care folks are so much more versed in different things because you have to be…". There is also open collaboration between providers in Juneau and other medical facilities. One participant noted how this relationship with outside medical facilities aids in the decision making on the treatment of patients to reduce the need of a medevac, "… physicians will call the specialists and consult … and sometimes that has help[ed] us take care of patients here in town instead of having to send them out…".

In the instance a patient does travel for emergency or non-emergency reasons, interviewed providers mentioned a service not being locally available, a lack of confidence in the local provider, and the patient's preference to see specialist as contributing factors. A lack of specialists was noted by providers as reasons for both non-emergency travel and emergency medevacs.

Accessibility

According to Penchansky and Thomas, accessibility is to be measured in geographic terms that captures how reasonably close a service is (Penchansky and Thomas 1981; Saurman 2016). However, when working at the regional scale - in this case Southeast Alaska - the definition of "reasonable" varies depending on the community, available services, and transportation.

In rural Alaska, for example, accessibility is going to be different between Tenakee Springs and Sitka. Not only are these two communities' different sizes but they also have different available medical services and modes for travel, both locally and between communities. For instance, local transportation to the nurse clinic in Tenakee Springs (Image 4 Appendix) may consist of walking down the street or a short drive on a four wheeler. While in Sitka, local transportation may require a taxi, bus, or personal

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vehicle to access services. This makes accessibility to local services better in Tenakee Springs than in Sitka. However, as with many rural Alaska communities there are occasions where needed medical services are not available locally and travel to another community is required. In this case whether the patent needs emergency or non-emergency transport, Sitka has a higher level of accessibility due to access several daily commercial jets (direct flights to both Juneau and Seattle) and a small plane service, a locally stationed medevac jet, and ferry service to Juneau three times a week. Compared to Tenakee Springs where they receive float plane service 1-2 times a day, ferry service twice a week, and, due to the lack of infrastructure, medevac service has to be provided by a non-wheel air craft (float plane or helicopter). Overall, reasonable access to medical services in rural Alaska is not only a matter of accessing services locally but in other communities as well.

In Juneau, accessibility is tied to access of local transportation more so than the access of services. As a micropolitan community, Juneau has a wide variety of medical services available most of which are clustered together throughout town. These medical service clusters can be accessed by private vehicle, taxi, scheduled Care-A-Van service, and the public bus system. However, despite Juneau being a relatively urban community, there are challenges with accessibility to transportation. When using transportation other than a personal vehicle, cost and service timetables must be considered. For example, while the public bus system operates throughout Juneau, service is limited to major roads and does not extend out to residents who live on the fringes of town.

Despite the variability in accessibility to services between rural communities and Juneau, the cost of travel between communities is a significant factor in determining

accessibility to health services. Cost not only being the monetary cost of a plane or ferry ticket, but also transportation schedules, cost of time taking off work or being away from family, and, in the case of emergencies, available infrastructure to support medevac aircraft. For those who make the deliberate choice to live on the fringes of communities or in rural communities, an important question remains to be asked: What level of comfort with risk and measure of decreased access to services is required to live a certain lifestyle?

Accommodation

An important component of access to medical services is the ability to utilize them. This includes wait time to see a provider, hours of operation, and being able to physically enter the building among others (Penchansky and Thomas 1981; Saurman 2016). In Juneau and Skagway, where interviewed participants lived, medical clinics tended to have extended hours outside of the normal "9 to 5" weekday hours. For many, these extended weekday hours of operation allow patients to make appointments before and after school or work. Additional weekend hours were limited but did provide flexibility for those with commitments during the week. Wait time to receive an appointment varies depending on location and service. For example, in Juneau, a patient can get an appointment quicker with a family or primary care provider than a physical therapist. In the case of emergencies, services in rural Alaskan communities vary. Emergency services may be provided by a community hospital, a 24-hour on call nurse, or a volunteer fire fighter/EMT. In Juneau, there are two options for emergency care. During business hours, Juneau Urgent and Family Care provides a wide range of medical services and lab tests. Otherwise there is the 24-hour emergency room at Bartlett Regional Hospital.

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Affordability

Affordability concerns are, as revealed through interviews, mainly linked to the cost of medevac services and the role of insurance in paying for said services. First, similar to other medical services rendered in Alaska, the cost of a medevac is high. Estimates from interviewed providers stated that an air medevac from Skagway to Juneau cost about $30,000; a medevac from Juneau to Anchorage or Seattle could range anywhere from $45,000-50,000 depending on the distance to the destination. However, that figure may not include medical costs (personnel, medical procedures, and medical supplies). Meaning the end cost of a medevac could easily rise to another estimate hovering about $100,000-125,000. While both prices seem high, multiple interviewees revealed that this is not improbable considering a medevac includes chartering a private jet, a personal medical team, medical supplies, and logistical coordination.

Second, due to the high cost of this vital service, insurance that includes emergency medevac is valuable. Despite recent estimates that put Southeast residents at 82% health insurance coverage (Rain Coast Data 2018), the inclusion of air medevac services in health insurance varies by plan. One interviewee expressed concern over the uncertainty of medevac being included in health insurance plans, "Hopefully, you have insurance that is understanding of…Juneau's location and what Juneau can do [medically]". Government and native health insurance plans cover much of the cost but there still may be residual out-of-pocket expenses. Private insurance plan may include medevac transportation but there may still be a co-pay, of typically 20%. Additionally, medevac coverage does not ensure that the patient will fly with a medevac company that has a contract with their insurance provider. While medical providers will try and match a patient's insurance with a covered medevac company, the availability of aircraft and the

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time sensitivity of the emergency may not allow for it. It is this uncertainty that motivates many people to buy supplemental insurance provided by the medevac companies. Several, of the medical providers interviewed emphasized the importance of having this additional coverage especially considering the characteristics of the area they live in and the potential need for a medevac. One provider said that they recommend at-risk patients - patients who have a serious chronic medical condition or are pregnant - that they purchase additional medevac coverage, "I do talk to patients that are [pregnant] on bed rest or they are preterm and at risk of delivering early…300 dollars is a lot cheaper than, what's 20% of 40,000?" Even if individuals are not at-risk patients, two interviewees providers stressed the importance of planning for the unexpected despite the extra costs of medevac insurance because of the potential financial benefits in event that an emergency does occur. As one of these providers mentioned, "Although it is an additional cost, for many the annual cost of additional insurance that covers the whole family is worth it compared to the potential co-pay of an air medevac." This sentiment is strong, that as another provider mentioned, some people even receive supplemental medevac insurance as gifts. An example provided was parents gifting supplemental medevac insurance to their young adult children.

Medevac

The overall theme of Medevac was broken down into five categories: Medevac Providers; Medevac Procedure; Challenges; Seasonality and Tourism; and Government Policy. Since the role of air medevac is an important part of this research, the system as a whole is analyzed. Taking care to understand who the players are, what steps are required for obtaining and carrying out a medevac, what challenges influence access to medevac

services, and other factors that influence the ability of medevacs to operate and provide services in Southeast Alaska.

Medevac Providers

There are currently three medevac companies providing services in Southeast Alaska. The first two, Guardian Flight and LifeMed, provide transportation services from Southeast communities to Juneau, as well as from Juneau to Anchorage and Seattle. The third company, Airlift NW, also conducts flights in the region, but interviewed medevac personnel stated that they primarily operate between Juneau and Seattle. Of the three companies, Guardian has the most offices with bases located in Juneau, Sitka, and Ketchikan, with a total of four aircraft. Airlift has two aircraft and LifeMed has one aircraft based in Juneau. However, it was mentioned by multiple interviewees that LifeMed has established a base in Skagway as well.

As mentioned before, due to the high cost of medevac services, it is important to have insurance coverage. Unfortunately, the amount of an air medevac covered by health insurance varies by plan. To address this variability, all three medevac companies (Guardian Flight, Airlift NW, and LifeMed) offer their own annual membership programs. Many of the medical providers that I interviewed stressed the importance and benefits of applying for these programs. For example, Guardian Flight membership covers the household and dependents under twenty-six years of age for $125 per year with them or any of their partners (Guardian Flight 2018). Airlift NW offers an annual household membership for $99 per year providing services in Alaska and the Pacific Northwest (UW Medicine 2018). Lastly, LifeMed offers an annual membership for a household for $45 per year providing service throughout Alaska and NW Canada (LifeMed Alaska 2018).

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Medevac Procedure

Mobilizing an air medevac is a complex process involving several individuals at multiple organizations. Based on responses from participants, that had experience with the process of ordering a medevac, the process is executed in three phases: 1) the need for a medevac is established, 2) medevac aircraft and patient are prepped for transportation, and 3) the flight and transfer of the patient to the receiving hospital. First, a medical professional determines that the patient's medical condition is beyond the capabilities of local resources available. Often the person to make this call will be a physician or the ranking medical provider present. Next, that medical provider must find a hospital where a doctor is available and willing to take the patient. Once a receiving doctor has been secured, the patient's physician- or medical provider- contacts the medevac company's hotline to determine which company has the first available aircraft.

At this stage the process is turned over to the medevac company, and the process goes one of two ways depending on whether the patient is local or in a community outside of Juneau. If the patient is in Juneau, once a request has been processed three things happen. First, the flight nurses are notified, and they ride in the ambulance, from the fire station at the airport, to the hospital to prepare the patient for transportation. Second, the pilot begins flight checks and prepare the plane for the flight. Third, the office processes the patients' health insurance. While a lack of medevac insurance will not prevent a patient from receiving a medevac service, efforts are made to have all possible administrative work completed at the time of flight departure. Once the ambulance returns to the airport, where the medevac bases are located, the patient is transferred to the aircraft with the flight nurses and the plane takes off.

If the patient is in a community outside of Juneau, for example Sitka, after the medevac hotline receives a call requesting a medevac, the office will determine if there is an available aircraft and the pilot will assess the weather conditions in the area. Once an aircraft is available and the pilot gives the green light, the air craft is prepped and the plane departs approximately thirty-five minutes after the final 'ok' is given. Upon arrival at the airport the flight nurse either takes a taxi or an airport vehicle to the hospital to prep the patient for transport and, if possible, make arrangements for a family member to travel with. Then an ambulance transports the patient, flight nurse, and family member back to the airport where the aircraft is fueled and ready to take off.

While enroute to the receiving hospital, the flight nurses keep in contact with the company doctor via sat phone in case a patient's vital signs change and they need to consult on appropriate action. Upon arrival at the destination airport, in either Anchorage or Seattle, the patient is moved to a waiting ambulance. The flight nurses accompany the patient until they are rendered into the care of the receiving hospital. The now refueled aircraft waits for the flight nurses to return and then heads back to Juneau.

Medevac Challenges

Throughout the interviews, providers unanimously agreed that weather was the biggest challenge faced by medevac operations. Southeast Alaska is a temperate rainforest, meaning that fluctuating overcast conditions, strong winds, and rain are constant factors. The impact of weather on the ability of a medevac aircraft to depart was mentioned several times by interviewed providers, such as: "The weather is the biggest problem. Juneau often has fog at the airport, which can mean that flights cannot get in or out sometimes." Also, "…in Southeast Alaska the weather is unpredictable, and the scary thing is if you can't fly you can't fly…You know you're stuck, and you have to wait and

that can get really scary." Weather conditions can act as a barrier for patients with medical emergencies since medevac aircraft must adhere to Federal Aviation Administration (FAA) regulations, regarding minimum daylight and cloud ceiling height.

In some communities, the physical geography plays a significant role influencing flight conditions. Interviewees gave two examples of instances when the landscape played a critical role in determining flight conditions. First, due to Skagway's location at the base of a mountain in a deep glaciated valley, aircraft can only operate when the cloud ceiling and daylight provide adequate visibility. Unlike commercial jets that operate in the region, medevac aircraft are not equipped with instrument landing systems. Two interviewees pointed out how daylight is an issue during the winter when limited hours of daylight are further reduced by the high valley walls. As one provider explained, "…because of [the way Skagway] is situated in the cleft of a mountain they can only fly during daylight hours… Yeah, so darkness and weather of course... [are] huge factor(s) in the wintertime…"

A second example involves the community of Petersburg located on Mitkof Island. An interview with an experienced medevac pilot stated that Petersburg was consistently the most difficult community to access due to frequent socked-in conditions. The combination of weather and physical geography had, on more than one occasion, prevented a patient from getting out for several days. "So trying to get a patient out of Petersburg sometimes can take days…there have been quite a few times where a patient we picked up from Petersburg where they had been waiting a couple of days to head south". The same participant continued to explain, how in such scenarios, medevac companies sometimes coordinate with the local US Coast Guard (USCG). Unlike the

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medevac's jet/fixed-wing aircraft, the USCG MH-60 Jayhawk helicopter, based in Sitka, can fly in more challenging weather conditions and have technology that helps facilitate low visibility navigation operations. Due to the alternative aircraft type and additional technology, the USCG are able to extract patients from Petersburg and rendezvous with a medevac aircraft in a nearby community.

Seasonality and Tourism

The effects of seasonality on the number of medevacs performed addressed the role tourism plays in the region, particularly in smaller rural communities. For four to five months of the year throughout the Southeast region, many local populations increase with tourism workers. In communities along the cruise ship route, this increase in local population is felt acutely. For example, Skagway increases from a winter population of 200-300 to a summer population of 800-900. This additional work force provides goods and services to the hundreds of thousands of visitors that sail through. The large influx of people can put strain on local medical services that are designed to serve a much smaller population. This increase in patient volume is reflected in the number of medevacs conducted. Skagway saw 80-100 medevacs flown in 2017 which is higher than the estimated 50 flights conducted in 2016. Both summer estimates are vastly larger than the average 10 medevac flights flown during the winter. Unfortunately, the number of medevac aircraft remains the same year-round leading to occasional aircraft shortages.

A large increase in the number of medevac cases, combined with challenges caused by weather, on occasion lends to a shortage in available medevac aircraft. One interviewee gave an example where all the aircraft, including the Coast Guard, were unavailable. Fortunately, they were able to get a medevac flown down from Anchorage and the patient was stable enough to wait. Despite the challenges faced by medevacs, one

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interviewee made it a point to mention that improvements have been made to the system over the years.

> "I have been doing this for about 10 years now, and before we would often have to wait hours, frequently we still have to overnight patients we simply can't get them out. … with two flight services out of Juneau it has really cut down of the flight time and how long it takes for medevac services to get there so overall services have improved."

This is encouraging because while little control can be had over weather conditions and patient volume, increased efficiency in air medevac transport can make all the difference in an medical emergency scenario.

Medevac Government Policy

Despite the complex process of organizing a medevac, the process is routinely executed smoothly with only minor setbacks when dealing with weather, availability of aircraft, and stability of the patient. As appropriate, FAA policy gives departure priority to medevac flights over private and commercial flights. However, one comment given by an interviewee brought up a valid concern when it comes to medevac flights in the event of a state of emergency:

> "on 9/11… we had never been attacked like that before except for Pearl Harbor so they closed down the airspace system…then they shut it down even more and our plane …wasn't able to get back to Juneau. And it left us vulnerable, we knew we were safe…but the government bureaucracy they just didn't know what to do so they have theses blanket rules…."

The situation described above occurred on 9/11, which resulted in a total shut down of US airspace. While this decision is understandable, up until the final shutdown several medevac flights were conducted that day between Juneau and Seattle.

Being cut off from advanced medical services is a serious concern in the context of Alaska. An inability to travel is an important issue especially when the Department of

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Homeland Security (DHS) lists EMS services as a Critical Infrastructure Sector. Air service in general is an essential service in geographically isolated regions. According to the DHS *Emergency Services Sector –Specific Plan*, emergency health care is dependent on local services, and transportation services are expected to be able to transport people and supplies locally and nationally.

> "The ESS (Emergency Service Sector) depends on a resilient transportation network in order to effectively respond to emergencies. Response vehicles must be able to transport people, goods, and services to and from incident areas. This includes the movement of ESS assets to other geographical locations throughout the Nation" (U.S Department of Homeland Security 2015, 9).

In the event of another complete airspace shut down the above mentioned tasks would become difficult to conduct in Alaska. While these requirements could be conducted by boat, there are limitations in the number vessels capable of large mobilization and the areas that can be accessed considering the lack of road networks in the region. The time it takes to travel between communities by boat also needs to be taken into consideration. For example, it takes a minimum of three days to travel by ferry from Juneau to Bellingham WA, the nearest US port in the lower 48. Government policy needs to take the importance of emergency air travel, in geographically isolated areas, into consideration when developing national emergency procedures.

Chapter 6: Summary and Conclusion

Summary

There is a lack of published, centralized, and current information on the Southeast Alaska health care system, opportunities and challenges in accessing that health care, and on the role of medevac services. This knowledge gap provided an excellent opportunity for this research to take place. Using a qualitative research approach, multiple resources were used including: online resources, personal lived experience and field observations, and most importantly, interviews with health care and medevac providers. Originally, geared towards looking at the utilization of local medical services and the role of air medevac in the health care system of Southeast Alaska, it became clear that a need for understanding how medical services were provided, how those services varied between communities, and the role that medevac services played in accessing those medical services were fundamental questions that needed to be answered.

As the section on 'Providing Health Care in Alaska' reveals, the health care system in Southeast Alaska is complex consisting of a network of partially overlapping systems of public, private, tribal and military (Coast Guard) providers. Health care delivery in Southeast Alaska is greatly shaped by the regions geographic setting which consists of geographically isolated island and coastal communities, dramatic mountains and fjords, and continually changing temperate weather. Within this context, marine and air transport services play an important role in enabling access to health care by providing transportation between communities within the region, and between Southeast communities and larger comprehensive medical services in Anchorage and Seattle.

Medevac is a crucial component and plays a vital role in providing access to health care in medical emergencies.

Questions asked of health care and medevac providers drew on the concepts of Penchansky and Thomas's access theory (availability, accessibility, availability, accommodation, acceptability). Interview responses revealed the relative importance and relationships between Penchansky and Thomas' concepts, which aided in drawing together broad factors that influence access to health care in Southeast Alaska. Based on the results, strong connections were established between the availability of services and the regions reliance on marine and air transportation. Due to uneven availability in a hierarchically structured health care system, the transport of patients within Southeast Alaska to Juneau or beyond, to Anchorage or Seattle, fills service gaps by giving patients access to multiple levels of health care services. For emergency air transport, the high cost of this service is a significant factor that leads to increased needs for additional and unique insurance plans. Inclement weather, difficult landscapes, aviation restriction on flight conditions, and the navigation equipment of medevac aircrafts have additional impacts on medevac service providers and their ability to transport patients in emergencies.

In this setting, primary care providers have, as was noted by interviewees, remarkably comprehensive expertise in diagnosing and providing health services. In some instances, their efforts are aided by communicating with specialists in Anchorage or Seattle to reduce the need for medical travel. Despite the comprehensive knowledge base of many primary care providers, many of the reasons cited for the need of health care travel were based on the lack of a specialty provider, procedure, or facility capabilities.

To support additional access to local medical services several clinics provide scheduling options for outside normal business hours. This helps by providing opportunities for those who cannot afford time off work or families to have more flexibility in receiving care. As mentioned previously, many primary providers possess a broad spectrum of knowledge and experience lending them more capabilities then similar providers in urban areas. This additional knowledge and ties with local communities lends to general acceptability. In the case that a patient does travel to receive medical services in another community, interview participants noted lack of confidence and desire for a specialist as the most common factors. Despite high numbers of recent health insurance enrollment, it does not always cover the high medical costs experienced in Alaska. Medical costs that do not include the additional travel costs incurred by receiving needed medical services in other communities.

Caveats

While the interviews conducted for this thesis revealed a great wealth of information there are limitations that should be addressed. First, due to the relatively small number of interviews, and the partial loss of one interview, the results provide only a snapshot of a much larger picture. While the health care and medevac providers who responded to requests for interviews mainly worked in Juneau, many of them had varied experiences that offered comprehensive insight into health care in surrounding rural areas. Some of the clinical nurses had previously worked as flight nurses, others were raised in rural Alaskan communities, while some had EMS training and work experience in rural Alaska. The participants that were interviewed therefore provided insight from multiple perspectives. Second, users of the health care system were not included in this research, simply because their inclusion would go beyond the scope of a master's thesis.

Third, this research was focused on determining the Southeast health system as a whole. As such factors that influence access to individual health systems were not addressed.

Opportunities for Future Research

The caveats listed above provide opportunities for future research into access of health care in Southeast Alaska. This research could be continued and expanded upon by interviewing a larger pool of participants in a face-to-face setting that would allow for longer interviews. Also, by including health care users in the interview process, comparisons and conclusions could be drawn as to what factors facilitate access and act as barriers to health care from both provider and patient perspectives. Continued research could also focus specifically on access to a single health care system, or how the increased utilization of telemedicine could impact access to medical services. Due to the isolated nature of Southeast communities, greater implementation of telemedicine could prove useful in providing more comprehensive medical services to small communities and villages with limited to no primary care. Alternatively, a mixed-method approach could further benefit health care access research by combining rich local qualitative data with spatial modeling. Spatial modeling methods, such as the Two Stage Floating Catchment Area (2SFCA), have been used extensively in health care access research around the world (Ngui and Apparicio 2011; Luo and Whippo 2012; Langford, Higgs, and Fry 2016; Song et al. 2018). Considering the complex health care system, multiple transportation systems, and geographic challenges of the Southeast region, and Alaska as a whole, combining a spatial analysis component to qualitative data could be largely beneficial to further understanding access to local health care services.

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Conclusion

This research provides a broad understanding of the overall health care system in Southeast Alaska as well as factors that impact access to those medical services. In a time where government agencies are striving to increase the health outcomes of citizens, understanding current health care systems and the needs of an area's population is vital in achieving those goals. By ensuring that all citizens have adequate access to health services, health organizations can work with residents to reduce rates of chronic illness and promote healthy lifestyle habits.

It is important to keep in mind that health affects not only the individual but also their family and their community. In a region where there are strong social and cultural ties, it is important to structure health care and medevac policies that include existing programs that meet and reflect the needs of the people it serves. By promoting programs, such as the Community Health Aid Program (CHAP), it encourages the retention of local skilled health care providers who have connections and a vested interest in their community. This is important as each community possesses a distinct personality. That distinctiveness, combined with other challenges associated with living in rural Southeast Alaska, can make it difficult to attract outside health care providers who do not possess personal or cultural ties to the area.

One could argue that limited access to services is part of the cost of living in isolated communities. However, where one lives is not always a matter of choice, for many in Alaska there are significant cultural and social ties associated with the community and the land around it. While it does make ensuring adequate access to health care challenging, it should not be a reason to neglect those areas. By promoting programs, like CHAP and telehealth, policy makers would be supporting a health care

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system that acknowledges that to many Alaskans living in the "The Last Frontier" is not just a quirk, it is a way of life.

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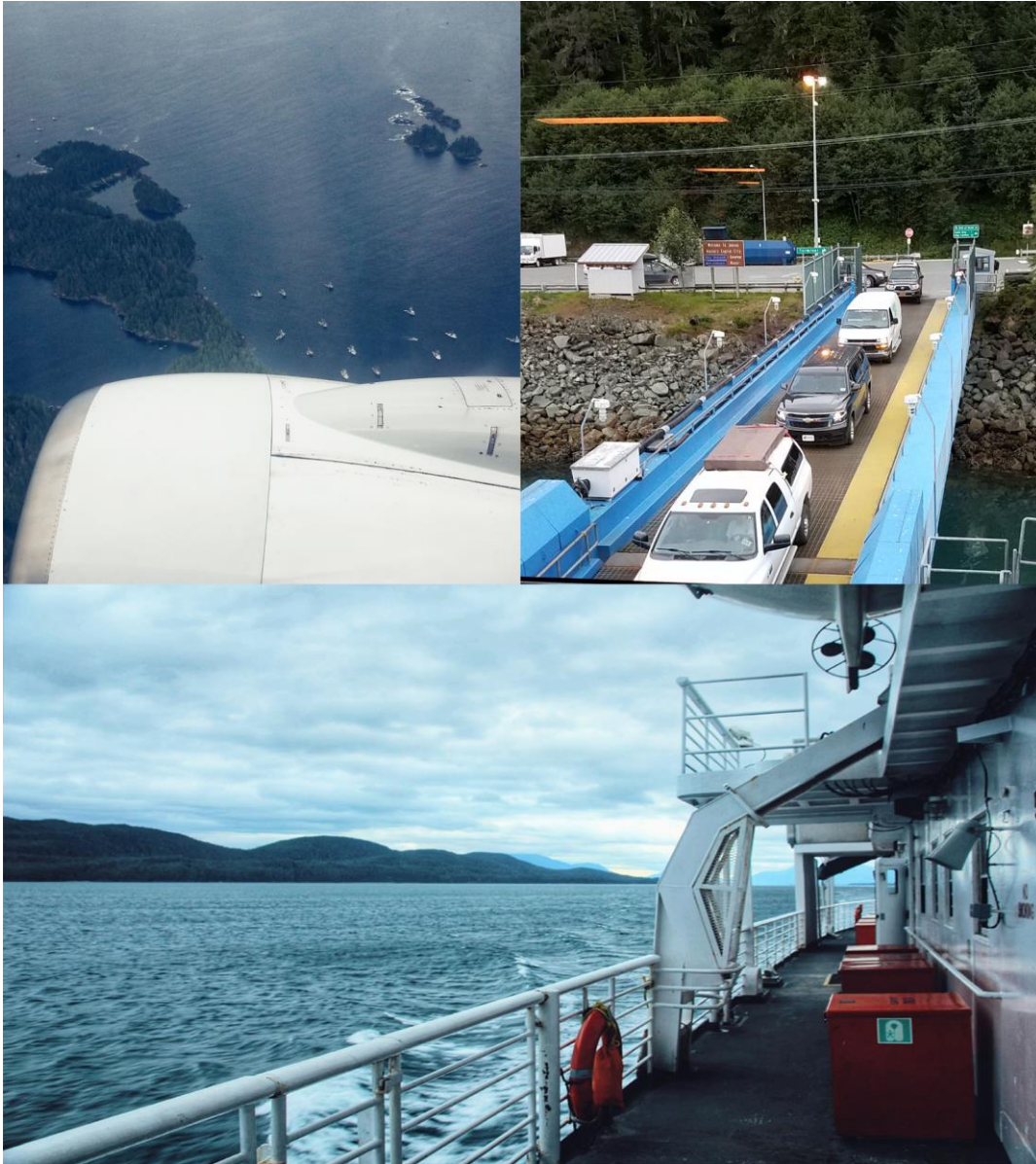
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Appendix: Images

Image 1: Modes of Transportation. Commercial jet flies over commercial fishermen while on decent into Sitka (*top left*). Vehicles que to load onto a ferry bound for Gustavus (*top right*). M/V LeConte underway to Tenakee Springs and Angoon (*bottom*).

Image 2: Cultural influences in Southeast Alaska. Haida totem pole in the State Office Building in Juneau (*top*). Fedrelandet #23 Sons of Norway Hall and Middle Harbor in Petersburg Alaska (*bottom*).

Image 3: Rural Southeast Alaska. Views of Angoon (*top*) and Tenakee Springs (*bottom*) as seen from the ferry.

Image 4: Rural Alaska Health Clinics. Nurse health clinic in Tenakee Springs (*left*). Health center in Pelican (*right*).