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# Sugar Island Finns: Introducing Historical Network Analysis to Study an American Immigrant Community

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***Abstract**: This article will provide a preliminary overview of Finnish migration to Sugar Island, Michigan, which occurred primarily between 1915 and 1940, based on narrative sources and census documents. It will introduce and apply social network analysis (SNA) methods and network visualizations to this community and sets the stage for a future, in-depth study of the Finns of Sugar Island. This article is part of a larger project HUMANA-Human Migration and Network Analysis: Developing New Research Methods for the Study of Human Migration and Social Change (https://blogs.helsinki.fi/humananetworks/), funded by the Finnish Kone Foundation. This project will develop new methodologies for studying the human past by using network analysis to better understand social, political, administrative, economic, and geospatial networks. For the purposes of this article, our main sources are the US Census returns from 1920 to 1940, and they will be supported by other archival and secondary sources. The scope of analysis will focus primarily on a few prominent individuals but will also provide information on the social structures of the Finnish community. Ultimately, this case study develops an experimental computer model of the Sugar Island Finnish community and will provide a glimpse into the authors' forthcoming project that aims at building a robust dynamic model of the entire Sugar Island community over the period of 1850-1940.*

***Keywords**: Finnish Americans, immigration studies, historical network analysis*

**Sugar Island and Finnish Migration to Michigan**

Sugar Island is an island in the United States located in the St. Mary's River, which is the waterway by which Lake Superior empties into the other Great Lakes. There is a stretch of rapids on the St. Mary's River, which the colonial French named *Sault Ste. Marie*. The settlement of Sault Ste. Marie dates to 1668. French traders and indigenous people had, of course, visited the site earlier. Today, the international border between the United States and Canada runs down the St. Mary's River. The city of Sault Ste. Marie, Michigan, on the US side of the border, has approximately 13,000 residents. The Canadian city of Sault Ste. Marie, Ontario, has approximately 73,000 residents.[1] Sugar Island is its own township and lies just southeast of the city of Sault Ste. Marie, and both reside within Chippewa County, Michigan. The island is approximately twenty-six kilometers long north to south and thirteen kilometers east-to-west at its widest point (see Figure 1). It is home to approximately 700 permanent and several hundred seasonal residents.[2]

Sugar Island was part of a broad territory occupied by the Chippewa (Ojibway) Indians. The name of the island probably comes from the Chippewa language *Sisibakwato Miniss*, which means "Sugar Tree Island."[3] The earliest European explorers–mostly French trappers, traders, and missionaries–in the Sault Ste. Marie area arrived in the late seventeenth century. In the early and mid-nineteenth century, American settlers moved into Michigan and increasingly put pressure on Indian landholdings. By a series of treaties, the United States government dispossessed the Sault Ste. Marie Chippewas of their tribal land base in exchange for individual land allotments, annuity payments, and other benefits.[4] The first federal census specific to Sugar Island was collected in 1860, indicating that population on the island had around that time increased significantly.

1 "Our Local History," Sault Ste. Marie, Pure Michigan, accessed March 11, 2019, https://www.saultstemarie.com/soo-area-and-great-waters-region/our-local-history/; "Local History," City of Sault Ste. Marie, accessed March 11, 2019, http://saultstemarie.ca/City-Hall/City-Departments/Community-Development-Enterprise-Services/Community-Services/Recreation-and-Culture/Historic-Sites-and-Heritage/Local-History.aspx. We wish to express our thanks to the Sugar Island Historical Preservation Society, especially David Bean, Jim and Connie Pim, and the Leighton family, as well as to Olli Saukko and Justin R. Gage for invaluable research assistance.

2 US Federal Census 2010, http://www.census.gov/2010census, accessed January 2, 2016.

3 Bernard Arbic, Sugar Island Sampler (Allegan Forest: The Priscilla Press, 1992), 17.

4 The Treaty with the Ottawa and Chippewa Nations of Indians, Washington, DC, 7 Stat. 491, March 28, 1836; the Treaty with the Ottawa and Chippewa Indians of Michigan, Detroit, MI, 11 Stat. 621, July 31, 1855; the Treaty with the Chippewa of Sault Ste. Marie, Detroit, MI, 11 Stat. 631, August 2, 1855.

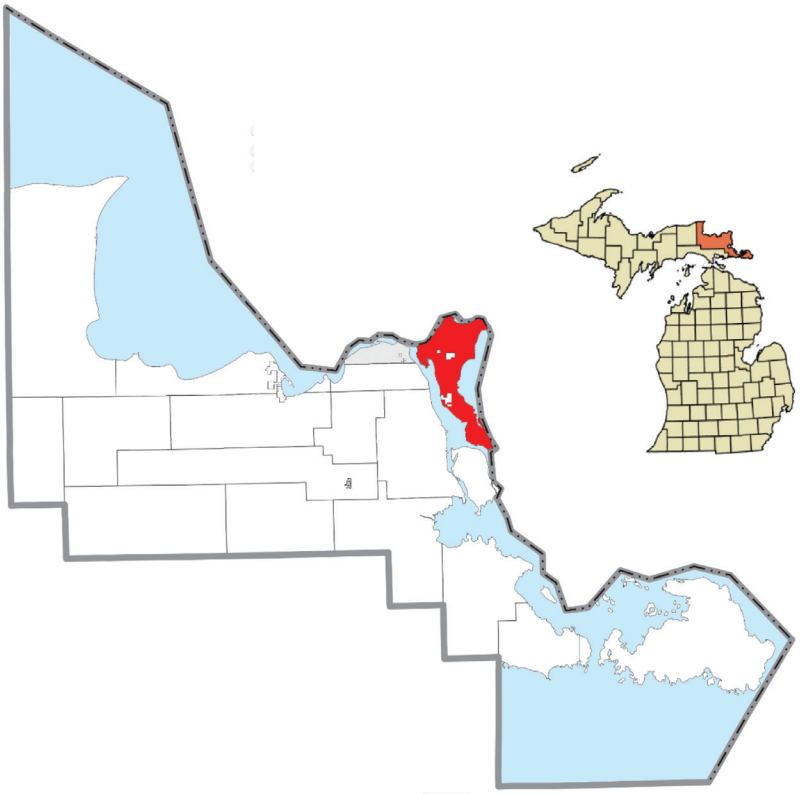

**Figure 1:** Sugar Island (in red) is located outside the town of Sault Ste. Marie, Michigan, along the border between the United States and Canada. Map: Wikimedia Commons.

The first Finns arrived in Michigan in the 1860s, but significant immigration started in the 1880s. By 1920, the number of Finns in Michigan was 30,096 and by 1930, the total Finnish population of Michigan was 74,229, of whom 27,022 were foreign-born and 47,207 native-born.[5] In the early

5 Department of Commerce, Bureau of the Census, "Fourteenth Census of the United States Taken in the Year 1920," Volume III, Population 1920, Composition and characteristics of the population by states (Washington, DC: Government Printing Office, 1922), 493; U.S. Department of Commerce, Bureau of the Census, "Fifteenth Census of the United States: 1930," Population, Volume III, Part I, Reports by states, showing the composition characteristics of the population for counties, cities, and townships or other minor civil divisions, Alabama-Missouri (Washington, DC: Government Printing Office, 1932), 1122. See also John Wargelin, The Americanization of the Finns (Hancock: Finnish Lutheran Book Concern, 1924), 66.

twentieth century, most of these Finns lived in Copper Country, which is an area on the south shore of Lake Superior. Many Finns worked in the copper mines, as well as in the forestry, fishing, and railroad industries. The first Finns to the Sault Ste. Marie area in the 1880s found work in the nearby lock. In later years, some Finns found work in the hydropower complex beside the locks.[6]

Sugar Island presents an interesting opportunity to investigate Finnish immigration in a very ethnically diverse setting. While this article focuses mainly on Finnish networks, our larger project aims at looking at how various ethnic groups created a community on a small island. Sugar Island is a space bordered by waters and allows us to explore community structures, networks and societal changes over a long period of time in a clearly defined setting. As our research has progressed, it has become evident that Sugar Island is not a typical Finnish community in its origins nor occupational characteristics. The Finnish immigrants originated from various parts of the home country, not predominantly from Ostrobothnia as was often the case. Further, against the usual miner-laborer narrative, the aim of the Sugar Island Finns was to colonize the island and make it an almost utopian farming community.[7]

Sugar Island was, of course, not empty. Inhabited not only by the Chippewa but several hundred residents of French Canadian, American or British descent, it was, however, still an underdeveloped rural and forested area.[8] The first Finn to settle on Sugar Island was Frank Aaltonen. He was convinced of the great prospects of the island and seems to have believed that he was settling on an untamed land. He purchased land from a Chippewa Indian in 1915 and started farming, proudly describing himself as a "farmer and colonizer."[9]

6 Armas K. E. Holmio, History of the Finns in Michigan (Hancock: Finlandia University Press, 2001); Gary Kaunonen, Finns in Michigan (East Lansing: Michigan State University Press, 2009); Auvo Kostiainen (ed.), Finns in the United States: A History of Settlement, Dissent, and Integration (East Lansing: Michigan State University Press, 2014); Allan A. Swanson, Sokeri Saari: The Finnish Community on Sugar Island (Sugar Island: The Sugar Island Historical Society, 2005).

7 Sault St. Marie Evening News, July 15, 1916, 5.

8 The 1910 census listed 627 inhabitants. 1910 United States Federal Census, Michigan, Chippewa County, Sugar Island Township, District 33.

9 Frank Aaltonen as quoted in U.S. World War I Draft Registration Cards, 1917-1918 [database online]. Provo, UT: Ancestry.com Operations Inc, 2005, Frank Aaltonen, Draft Card A, Michigan, Chippewa County; Frank Aaltonen interview, Sault St. Marie Evening News, July 15, 1916, 5. Aaltonen's deed to the land was recorded on September 22, 1915, but the available records are unclear about whether he immediately

Aaltonen had a vision for Finns and Sugar Island. In an interview in the *Sault St. Marie Evening News* he said that he wanted to free Finns from the slavery of the mines. According to Aaltonen, there was a "back-to-the-country" movement among the Finns in North America. Sugar Island, he believed, was a place of freedom and provided Finns with free land and friendly neighbors. The Finn, he continued, is an "energetic and able farmer, and his place is on the land and not in the mines where he can't have his freedom, which his mother taught him in childhood." Frank Aaltonen referred to the American ideals of freedom and liberty as he proudly set out to colonize Sugar Island with Finnish immigrants.[10]

After settling on his new land, Aaltonen began recruiting other Finns living in the United States and Canada to move there. For this purpose, he and fellow Finn Hans Hormavirta established the "Finnish Land Agency."[11] Through this agency, Aaltonen promoted Sugar Island as the perfect place for Finns to settle and promised to give them a fair deal in purchasing land. The first to follow Aaltonen's example were Robert Koski and August Saari in 1917.[12]

Frank Aaltonen was born in Hämeenlinna, Finland, in 1884 or 1885.[13] He arrived in the United States in 1905 and lived in Upper Peninsula Michigan where he became active in the labor movement. In his second year of residence in the United States, he was arrested for causing unrest and was suspected of being a communist because he participated in a socialist parade through the town of Hancock, Michigan.[14]

Aaltonen continued to be active in the Socialist Party of America (SPA) and in Finnish Socialist Federation (FSF).[15] From 1908 to 1914, he was the organizer for the Western Federation of Miners in Negaunee, recruiting several thousand miners into the union. He was also a leader in the famous

started living there. A Finnish couple seems to have resided on the island at least by the end of the same year, and several Finns had claimed land on the island by July 15, 1916, although they did not yet live there. Arbic, Sugar Island Sampler, 85; Swanson, Sokeri Saari, 3.

10 Frank Aaltonen Interview in "Finnish Land Agency," Sault St. Marie Evening News, July 15, 1916, 5.

11 Ibid.

12 Ibid.; Holmio, History of Finns in Michigan, 155-156; Swanson, Sokeri Saari, 3.

13 Passport File, Finnish Migration Institute: Frank (Frans) Aaltonen File.

14 Holmio, History of Finns in Michigan, 280, 294-296.

15 Elis Sulkanen, Amerikan suomalaisen työväenliikkeen historia [The History of the Finnish American Labor Movement] (Fitchburg: Amerikan Suomalainen Kansanvallan Liitto & Raivaaja Publishing Company, 1951), 485. http://www.migrationinstitute.fi/files/pdf/suomenkieliset_historialliset_julkaisut/amerikan_suomalaisen_tyovaenliikkeen_historia.pdf, accessed June 1, 2018.

Copper Country mining strike in 1913-14.[16] Eventually he engaged in serious disputes with other Finnish leaders within the socialist movement.[17]

These early years of Frank Aaltonen, as well as his later years in Massachusetts, have been well documented in historical literature, but it seems that scholars lost track of him for the years 1915 to 1930. One Finnish historian, specializing in the era, was surprised to hear that our research had located him in 1916 on Sugar Island, Michigan.[18]

Aaltonen left Sugar Island in 1929 and moved to Fitchburg, Massachusetts, where he worked in various managerial positions until after World War II, when he established his own Frank Aaltonen Company. Together with another influential Finnish immigrant, Oskari Tokoi, the company organized help from the United States to the struggling Finland through Social Democratic organizations. This help was crucial in the rebuilding of the war-ravaged country. Aaltonen died in Massachusetts in 1958.[19]

When Aaltonen left Sugar Island, he left behind a thriving community that he helped build. Even today, Sugar Island residents remember Frank Aaltonen and refer to the early years of the Finnish community as the "Aaltonen Era." People talk about him in a positive way, but his historical reputation is not without blemish. While no one denies his importance, he was sued for involvement in a local election fraud in 1929, which caused him to leave the island.[20]

Thus, before we built our datasets and visualizations, we anticipated that Aaltonen would be an important figure among the Sugar Island Finns. We

16 The Copper Country mining strike was the first unionized strike in Upper Peninsula Michigan. It lasted for nine months and resulted in the loss of the workers. The union was effectively driven out of the area and this caused many workers, Finns included, to search for livelihoods elsewhere. It is likely that Frank Aaltonen and possibly other Finns ventured to Sault Ste. Marie and Sugar Island as a result of the strike.

17 Calumet News, July 3, 1914, 2; Daily Telegram, July 4, 1914, 1. For more, see Mikko Majander, Demokratiaa dollareilla – SDP ja puoluerahoitus pulataloudessa 1945–1954 ["Democracy by Dollars: SDP and party funding in the post-war economy, 1945-1954"] (Helsinki: Otava, 2007); Gary Kaunonen, Challenge Accepted: A Finnish Immigrant Response to Industrial America in Michigan's Copper Country (East Lansing: Michigan State University Press, 2010).

18 Discussion with Mikko Majander, Helsinki, 2017.

19 See, for example, Majander, Demokratiaa dollareilla, 97-98, 110-111, 121-124, 140-146, 193-194, 202-203. About Oskari Tokoi, see Rainer Smedman, http://www.kootutteokset.fi/fi/node/82, accessed April 10, 2019.

20 Swanson, Sokeri Saari, 5-19. There are also allegations that Aaltonen served as the model for a character in the novel Joe Pete by Florence McClinchey. In the novel a Finn is portrayed as a greedy land speculator and lumberman with a questionable relationship with a Chippewa woman. See Arbic, Sugar Island Sampler, 93-94; Discussions with the Sugar Island Finnish Community, October 2015.

were eager to find out if other prominent individuals, institutions, or organizations would emerge from our model.

## Exploring the Finnish Community on Sugar Island Using Traditional Methods

The first step in exploring the Finnish community on Sugar Island was to acquire some basic demographic information of the individual Finns on the island. Federal census returns are foundational for this task, but not sufficient. The returns would have to be supplemented by other sources, including local history sources that, in turn, used census returns and other primary sources.

Although genealogists and demographers frequently use census documents, historians sometimes overlook them. At some level, this is understandable, as robust online databases with massive collections of queryable census documents, like Ancesty.com, have been widely available only in the past two decades. However, when trying to reconstruct historical communities, census documents can be informative. Newspaper articles, local histories, and other narrative sources often focus on prominent individuals. In contrast, census documents attempt to enumerate all individuals living in a community. Thus, for projects endeavoring to learn about all or most members of a community, or to learn about broader social, political, or demographic trends, census documents are invaluable.

In the United States, the federal government has conducted a survey of the nation's population every ten years since 1790. Census enumerators perform a comprehensive door-to-door count of the population, collecting information about each individual. Such information might include an individual's names, birth year, marital status, naturalization (citizenship) status, parents' birthplaces, occupation, and so forth. Different censuses collect different information, reflecting the contemporaneous concerns of federal authorities. The forms that enumerators use, are called the census returns. Shortly after the census is completed, the Census Bureau publishes anonymized abstracts of the data in the form of government reports. Then, seventy-two years after the census was taken, the federal government releases the actual census returns to the general public.[21]

21 This 72-year privacy restriction was put in place in 1978 and was chosen because it approximated the average lifespan of a resident of the United States (92 Stat. 915; Public Law 95-416; October 5, 1978). This

For our Sugar Island project, which begins with the arrival of Frank Aaltonen in 1915, the relevant census returns are from the 1920, 1930, and 1940 censuses. In working with these censuses, we first made a data table for each of the census years into which we entered, on a single row, all the census information for each Finn listed on the census. From these three data tables, we were able to perform a variety of searches, queries, or counting procedures on Sugar Island Finns. By analyzing these census tables and by using other supplemental sources, we were able to develop an understanding of the characteristics of the Finnish community.

As discussed above, Frank Aaltonen appears to be the first Finn to permanently settle on Sugar Island. He arrived in 1915, before the 1920 census, and we know that there were 101 Finns on the island by the time of the 1920 census. Of these, 61 were born in Finland.[22] According to the Finnish passport and travel records, most Finns living on Sugar Island in 1930 had left Finland between 1910 and 1911. Thus, they did not come directly to Sugar Island, but tried first to make a living elsewhere in the United States and Canada.[23] While many younger people living on Sugar Island were born in Michigan, some came via Canada, Minnesota, and one family from Australia.[24]

The people had come from various parts of Finland, ranging from Lapinlahti in the east to Oulu in the north. The backgrounds of many Sugar Island Finns were modest. Frank Aaltonen, for example, came from the Hämeenlinna area with a working-class background. In the passport records he was listed simply as a "son of a gardener."[25] Many did not own their own homes. They had either rented from or actually lived in other people's homes. So, for many Sugar Island Finns, the island presented new opportunities. In 1930, of the 42 Finnish heads of household, only one was a renter and the rest owned their own houses. In 1940, according to the census, only two of

law was, in turn, based on discussions held by officials of the Census Bureau, National Archives, and other federal agencies. Although the average lifespan of a resident of the United States has varied since then, as of 2019, the Census Bureau still adheres to the 72-year privacy restriction.

22 Swanson lists 101 Finnish surnames in the 1920 census; Arbic lists 102. Finnish names made up to 15% of the total island population. See Arbic, Sugar Island Sampler, 86-89; Swanson, Sokeri Saari, 4; 1920 United States Federal Census, Michigan, Chippewa County, Sugar Island Township, District 0042 (hereafter 1920 Federal Census).

23 See Passport Records and Traveler Records at the Finnish Migration Institute. See also Arbic, Sugar Island Sampler, 85.

24 1920 Federal Census.

25 Passport File, Finnish Migration Institute: Frank (Frans) Aaltonen File.

the 55 heads of households were renters; the rest had been able to secure their own homes.[26]

Finns quickly found employment on the island, 33 out of the 54 adults were employed according to the 1920 census. Many of the Finns either farmed their own or worked as farm laborers, and the percentages were stable across all three censuses: 68 % in 1920, 67 % in 1930 and 1940.[27] In 1920 one person, Matt Leppi, worked as steel laborer and one, Waino Marsell as a decorator. Many reported simply as "laborers." By 1930 additional jobs had been found as painters, steel finishers, housekeepers, and one person, John Bowman Jr., had a job as a deckhand. By 1940 the array of jobs held by the Finns had grown to include bus driver, mail carrier, store keeper and teacher. John Keko operated his own boat rental business by the early 1930s and became well known in the larger Sault Ste. Marie area for his commercial fishing trips.[28] This shows not only the success of the Finns, but also the growth, diversification, and development of the entire Sugar Island economy. From a meager start in the early 1900s, the infrastructure had become better with several stores and post offices, and multiple schools and churches as well as taverns having been established on the island.[29]

The Finns were also eager to take jobs in road construction; a total of 25 Finns worked in road construction between 1920-1940. It was a way to earn extra money and to participate in community building. Most of the Finns who found work on the island were not highly educated, as would be suspected. The majority of adult Finns in 1920 had only completed a few years of elementary school. By 1940 two people had some college education and, according to census records, only one, Impi Curlis, had a college degree. However, an interesting person, whose education does not show up in the census records is Sylvia Kuusisto, who first attended school in Willwalk, continued to Sault Ste. Marie High School and County Normal School on the mainland, and completed the Teachers' College at Ypsilante, Michigan. After graduation she returned to Sugar Island and worked as a teacher in the Willwalk school. She married another Finn, Lauri (Lawrence) Hokkanen. In the 1930s they joined a group of Finns who moved to Karelia, Soviet

26 1930 United States Federal Census, Michigan, Chippewa County, Sugar Island Township, District 17-24 (hereafter 1930 Federal Census); 1940 United States Federal Census, Michigan, Chippewa County, Sugar Island Township, District 17-28 (hereafter 1940 Federal Census).

27 1920 Federal Census, 1930 Federal Census, 1940 Federal Census.

28 1930 US Federal Census; 1940 US Federal Census. See also Arbic, Sugar Island Sampler, 87-89. The Keko family ran the business until the 1950s.

29 Arbic, Sugar Island Sampler, 97-128.

Union. They did not find the utopia they were looking for, but, unlike many others, were able to return to the United States and Sugar Island. Their story is a very important part of Sugar Island Finnish history and their former homestead on Sugar Island is still standing, although abandoned.[30]

**Service Organizations, Public Works, and Administration**

Finns were very active in Sugar Island administrative boards and councils. Frank Aaltonen was particularly active, as will be analyzed in the graphs below. He was elected as the Supervisor of the Sugar Island Township Board eight times between 1920-28 and was a member of several other committees. Because Aaltonen was a member of so many institutions and was a long-time member and Supervisor of the Sugar Island Township Board, it appears that he had considerable authority and status within the community. Aaltonen was elected in the Sugar Island Township Board for the first time in 1918 when road construction was a major issue. He was elected four consecutive years until 1922. In 1923 he missed the election but returned in 1926 and continued until 1929.[31]

As the Supervisor of the Sugar Island Township Board, he was also member of Chippewa County Board of Supervisors (CCBS), a board containing the supervisors of the various townships within Chippewa County. As a member of the Dock Committee, he was part of a group that made decisions on building and operating a ferry to the mainland. This, of course, was a major issue for an island community. As the Building and Grounds Committee member and Clerk to the Highway Commissioner, he was in a key position to influence who would be assigned, for example, road construction jobs. It seems that his influence landed several of those jobs to Finns. Indeed, Frank Aaltonen seems to have been exercising significant public authority. His duties were wide-ranging, indeed; as CCBS board member he was in charge of compiling a list of dogs and dog owners on the island.

30 Arbic, Sugar Island Sampler, 86; Swanson, Sokeri Saari, 29. Swanson's research notes contain detailed information on Sugar Island individuals and families. Allan Swanson research notes, Sugar Island Township Records (hereafter, SITR), Chippewa County Historical Society (hereafter, CCHS), Sault Ste. Marie, Michigan. For more about Sylvia and Lawrence Hokkanen, see Sylvia Hokkanen and Lawrence Hokkanen, Karelia: A Finnish American Couple in Stalin's Russia, 1934-1941 (St. Cloud, MI: North Star Press of St. Cloud, Inc., 1991).

31 Swanson, Sokeri Saari, 18-19.

One Sugar Island resident later noted that there was nothing Frank Aaltonen could not or would not sell.[32]

While Frank Aaltonen served on more administrative boards than any other Finn on Sugar Island, there were other Finns who held key positions in the community. For example, Lauri (Larrie) Karimo served as the Justice of the Peace in 1930. Karimo was an interesting figure in many ways. Before immigrating to the United States, he competed in the 1912 Olympic Games in the 110 meters hurdles, and continued to compete in the United States. He was a skillful ski maker and provided skis for the community.[33]

Another example of a socially and politically active Finn is Emil Hytinen.[34] He first appears on Sugar Island in 1920 living as boarder with Matti Kauppi, and later he bought a farm from Aaltonen. In 1923 Hytinen became Highway Commissioner and in 1926 he served as the Election Inspector and Justice of the Peace for two years. In addition, he was appointed constable in 1928 and worked as county sheriff for several years.[35] John Keko, another active Finn was a member of the School Board 1940-42 and again in 1947. From 1943-45 he was the Treasurer of the consolidated School Board.[36]

In addition to Aaltonen, August Saari in 1920, Henry Siivonen in 1925, and Lauri Karimo in 1932 served as election inspectors. John Orasmaa served in the Election Board in 1939 after being a Justice for the Peace for three years in the early 1930s. August Saari acted as a Highway Overseer in 1926-1927. Roads and infrastructure projects seemed to attract many Finns. Emmanuel Syrjala, Thomas Korpi, Henry Eronen and Oskar Maki all served in various Road and Highway Commissioner or overseer positions.[37] In all, 25 Finns participated in road work and infrastructure projects.[38]

32 Swanson research notes, SITR, CCHS; Swanson, Sokeri Saari 16.

33 Interview with Jarl K. Hiltunen, May 31, 1998, 3, Swanson research notes, SITR, CCHS,–,; Arbic, Sugar Island Sampler, 86-110; Swanson, Sokeri Saari, 30-31.

34 His last name is spelled as Hyttinen, Hytinen, and Hyytinen in different sources, and although Hyttinen is the most common spelling in the sources, as well as the most common as a Finnish last name, it seems that he adopted Hytinen as his preferred spelling.

35 See Swanson, Sokeri Saari, 25-26; Swanson research notes, SITR, CCHS.

36 See Arbic, Sugar Island Sampler, 99-110; Swanson, Sokeri Saari, 34.

37 See Swanson, Sokeri Saari, 25-26; Swanson research notes, SITR, CCHS.

38 Swanson, Sokeri Saari, 6-9, 16-18; Swanson research notes, SITR, CCHS.

## Exploring the Finnish Community on Sugar Island Using Social Network Analysis

With three decades of census returns coupled with a general understanding of Finnish leadership and community structure, we had enough information to model and analyze the Finnish community on Sugar Island using some of the tools in the emerging field of network science and social network analysis.

Social Network Analysis (SNA) is the study of human social ties and relationships. SNA uses tools and methods associated with graph theory and network science.[39] In simple terms, many real-world entities can be modeled as "graphs" by using two types of objects: "nodes" and "edges." Nodes often represent entities such as people, places, events, and organizations. Edges often represent the relationships between the nodes. One might say that nodes represent nouns and edges represent verbs. Edges can be either "undirected" (i.e. mutual) or "directed," meaning that the relationship flows one way. Furthermore, one can add "attributes" or "properties" to nodes and edges that help specify that object's characteristics.

Building a graph can be a straightforward task. In graph theory, a foundational equation is $G = (V, E)$. This means that graph $G$ can be represented by a set of vertices (another name for nodes) $V$ and a set of edges $E$. As will be discussed below, a nodes table specifies all the unique nodes in a graph, and an edges table lists the edges that connect various pairs of nodes. Any table structure, like a spreadsheet or relational database table, can be used to build the graph. One can "traverse" the graph by following the edges from one node to another. A "path" exists between a pair of nodes $(n_1, n_2)$ when the graph contains a set of edges that, when traversed properly, can allow the graph to be traversed from node $n_1$ to node $n_2$.

Once a researcher builds a graph, there are a variety of metrics that can be applied, algorithmically, to the graph that will help reveal properties of the graph's structure. This article will discuss four important and widely-used metrics. Many of the most insightful metrics use algorithms that repeatedly and extensively traverse graphs and make edge-based calculations.

39 Albert-László Barabási, Network Science (Cambridge: Cambridge University Press, 2016); M. E. J. Newman, Networks: An Introduction (Oxford: Oxford University Press, 2010); Guido Caldarelli and Michele Catanzaro, Networks: A Very Short Introduction (Oxford: Oxford University Press, 2012); Albert-László Barabási, Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life (New York: Plume Books, 2003).

*Degree Centrality*: The "degree" of a node is the total number of edges connected to it. The "in-degree" of a node is simply the number of directed edges coming into the node, and the "out-degree" of a node is the number the directed edges going out of the node. This algorithm simply counts the degree of each node.

*Betweenness Centrality*: This metric finds the shortest path (if a path exists) between all pairs of nodes and counts the number of times each node appears on a shortest path. The more times a node appears a shortest path, the higher its betweenness centrality.

*Closeness Centrality*: For each node in the graph, this metric calculates the shortest path to each other node in the graph, sums the lengths of these shortest paths, and returns the reciprocal. Thus, nodes that seem centrally located with respect to shortest paths will have the highest scores.

*Page Rank*: This metric is named after its inventor, Larry Page, one of the founders of Google. Generally speaking, an algorithm repeatedly traverses a graph, entering it at random nodes. As it traverses a graph, it counts the nodes it encounters. The nodes that the algorithm encounters more frequently receive higher scores. The underlying presumption is that more important nodes (in Page's model, websites) receive more incoming links. Nodes to which important nodes point also score favorably, even though those nodes might not have many incoming connections themselves.

Modern software allow researchers to build graphs that include millions—or even billions—of nodes and edges with a broad variety of attributes. Such software provide researchers with a collection of tools for querying and traversing graphs. Researchers can analyze these graphs with dozens of built-in metrics and design and implement custom metrics for asking project-specific questions about a graph. Furthermore, there are software tools for visualizing graphs. These visualization tools offer researchers different algorithms for "laying out" graphs visually in two and three dimensions. Some tools can animate dynamic graphs. Thus, researchers can watch how graphs evolve over time. Perhaps a graph becomes denser, or less dense, over time; perhaps it splits apart; or, perhaps, separate networks coalesce into a larger unified network. Much of the sophisticated graph analysis today is done by physical scientists, biological scientists, mathematicians, and data scientists who are working with large corporations to manage complex systems or provide business intelligence. The social sciences, too, have made some use of graph modeling and social network

analysis.[40] It is our hope to apply some of these extraordinary tools to the field of history by modeling and analyzing historical communities and populations to better understand the human past.

Developing a historical social network research project is often a challenge. Researchers have to consider the source materials used for the project, what sort of data is contained in those materials, how that data might be modeled, and what questions can be asked. These questions can be particularly challenging if datasets are large, contain many different types of data, or span long periods of time. For some projects, the thought and preparation that go into data modeling can be extensive and time-consuming.

One way to engage these questions is to build a simplified experimental model. From working with the source material and developing experimental models, researchers can gain important insights into building robust, flexible models that lend themselves to analyses by a wide range of research tools and methodologies. Experimental models often illuminate both opportunities and limitations with the available sources and, thereby, help researchers develop a list of additional sources that should be consulted to create a more nuanced model. For this project, our goal was to familiarize ourselves with the key source documents, to build and critique a simplified social network model, to experiment with some analytical methods, and to develop ideas for how to further enhance and refine models for studying the Finns of Sugar Island.

Because social network analysis involves modeling people at the individual level, we knew that census data would be foundational for our model. As discussed above, we decided to focus on the period between 1915, when Frank Aaltonen arrived on Sugar Island, and 1940, which is the latest year for which individualized census returns are available from the federal censuses. Our selection criteria were straightforward: we wanted to model the people who were Finnish and resided on Sugar Island during this period.

Census returns are particularly valuable for building historical social network models. These returns provide not only a person-by-person listing of individuals living in an area, but they group individuals by *household*. This means that the censuses contain information about who is related to whom in each household. The censuses generally list family relationships relative

40 Marek Jerzy Minakowski, "Family Networks of an Emerging Jewish Intelligentsia in Cracow, 1850-1918," Journal of Historical Network Research 2 (2018): 53-75; and Aline Deicke, "Networks of Conflict: Analyzing the 'Culture of Controversy' in Polemical Pamphlets of Intra-Protestant Disputes (1548-1580), ibid. 1 (2017): 71-105.

to the head of each household. For example, a household might list a male who is the "head," as well as people identified as "wife," "daughter," "son," and "mother." The "mother" term would mean that the woman is the mother of the head-of-household, not of the individuals listed "daughter" or "son." It also means, in this example, that there are three generations of people living in that household.[41] It should be noted with a degree of criticism that the relational designations often reflect the enumerator's view, not always that of the household in question. Cultural traits, such as indigenous kinship relations, may not be considered. Similarly, unmarried women may appear in relation to a man instead of as heads of household.[42] In the Sugar Island case, there were a fair number of female heads of household, although only two or three per census among the Finns.[43]

What remained, was to determine which people on Sugar Island we wanted to include in our study of the Finns on Sugar Island. In general, this was a straightforward task. We included those individuals who were either born in Finland themselves or who had at least one parent born in Finland. We compiled a list of people across the three censuses. When building this list, we had to watch for variant spellings of first or last names and consolidate as appropriate so that the same person was not listed twice. Obviously, some naming variations can be resolved based on household context because, although spellings of names might change between censuses, family relationships often remain the same.

At this point, we have a list of 267 unique individuals of Finnish descent who appeared on the 1920, the 1930, or the 1940 census as living on Sugar Island. From this list we constructed a table of these individuals. Each entry in this table will be represented by a node in the graph model that we build. In addition to the information culled from the census returns, we must give each individual a unique identifier. This is important for many reasons; one is that it allows the graph software to unambiguously reference an object. Because these node objects represent individuals, the letter "I" is prefixed to a numerical string as illustrated below. In a slightly simplified mode, the table's structure looks like this:

41 The "head" in this example is the middle generation. The "mother" is the first ascendant generation from the "head," and the "son" and "daughter" are in the first descendant generation relative to the "head."

42 See Nancy Folbre and Marjorie Abel, "Women's Work and Women's Households: Gender Bias in the U.S. Census," Social Research vol. 56 (3) (1989): 545-569.

43 1920 Federal Census, 1930 Federal Census, 1940 Federal Census.

| UniqueID | FirstName | LastName | BirthYear | Relation |
|---|---|---|---|---|
| I0001 | Matt | Leppi | 1879 | head |
| I0002 | Annie | Leppi | 1887 | wife |
| I0003 | Jack | Leppi | 1913 | son |
| I0004 | Hilda | Leppi | 1914 | daughter |
| I0005 | Arne | Leppi | 1918 | son |
| ... | ... | ... | ... | ... |
| I0267 | Fname | Lname | YYYY | head |

**Table 1:** A simplified node table for individuals who appear on the census returns.

After building this table of individuals, the next step was to build a table listing the family relationships between the individuals.[44] Whereas the table of individuals will be a table of nodes, this next table of relationships will be a table of edges. Edges connect one node to another node; so, each row in a table must reference two nodes. The convention is to have a column of "source" nodes and a column of "target" nodes. Also, it is customary to have a column indicating whether a node is directed or undirected. We will call this column "type." Each edge must have its own unique identifier, and each edge can have various attributes associated with it. Thus, an edge table for the above-listed nodes representing the Leppi family might look like this:

| UniqueID | Source | Target | Type |
|---|---|---|---|
| E0001 | I0001 | I0002 | undirected |
| E0002 | I0001 | I0003 | undirected |
| E0003 | I0001 | I0004 | undirected |
| E0004 | I0001 | I0005 | undirected |
| E0005 | I0002 | I0003 | undirected |
| E0006 | I0002 | I0004 | undirected |
| E0007 | I0002 | I0005 | undirected |
| ... | ... | ... | ... |

**Table 2:** A simplified edge table specifying the edges connecting the nodes in Table 1.

44 For this experimental model, we chose to model only biological family relationships, like "mother," "father," "sister," "brother," "son," "daughter," and "wife." We did not model other household relations like "housekeeper" or "lodger."

When building an edge table, it is important to keep in mind that the methodology one chooses for connecting the nodes is crucial. These edges determine how a graph can be traversed and, as discussed above, many graph metrics involve traversing edges or counting edges. Thus, the "topology" of a network—that is, the collective structure of a network's nodes and edges—is often defined by choices that a researcher makes, therefore, the researcher should be aware that his or her choices can have a significant effect on how the network is analyzed and evaluated.

For this experimental model, we chose to connect a nuclear family as follows: two spouses are connected to each other via an edge representing a "spousal union" and, if the spouses are parents, a single edge connects each spouse (parent) to each child they share (see Figure 2). This structure can be extended to earlier or later generations by using the same basic methodology. In other words, each parent of a nuclear family is the son or daughter of another couple, and each child of a nuclear family might be the spouse of another individual—and this spousal union might have produced children. Individuals for whom there are no documented family relationships would not be connected by these kinds of edges, despite the fact that every individual descends from a male and a female parent.[45] Ultimately, for this model, we used 257 edges to connect family members to one another.

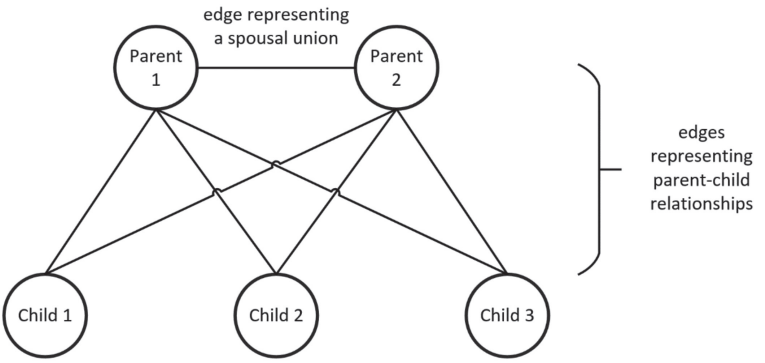


**Figure 2:** A way to represent the general structure of a nuclear family using graph modeling.

45 In real life, modeling human families can be more nuanced than described above. Nuclear families might include adopted children rather than biological children, and couples may divorce, find other partners, and have children by such subsequent unions. In the twenty-first century, it is likely to become possible to have children born with nuclear DNA coming from multiple parents, which might further complicate this model. For the purposes of this experimental model, these subtleties are not addressed.

For the experimental model, we wanted to include some nodes and edges that would help us understand how the Finnish people on Sugar Island were connected to one another via means other than family relationships. We decided to investigate how the Sugar Island Finns participated in political boards, organizations, or offices. This might inform us who the community leaders were and afford us insights into the nature of their leadership. The methodology for doing this, too, was simple and straightforward. We read through two books about the Finns of Sugar Island: Bernard Arbic's *Sugar Island Sampler* (1992) and Allan A. Swanson's *Sokeri Saari: The Finnish Community on Sugar Island* (2005), as well as Swanson's research notes, and made a note of any instance in which a Finnish individual participated in some political board, organization, or office. From these notes, we created a list of nodes that represented these organizations and appended this list to the above-mentioned nodes table.[46] These "organization nodes" often represent leadership positions of some kind, and thus would presumably be limited to a small set of leading Finnish individuals. Therefore, we decided to find an organization that would have broader community participation—both in terms of the number and the socioeconomic range of people who would participate in it. For this, we chose to model the "road work" activity as an organization node, even though it is not a formal organization.

For each individual who participated in an organization, we created a list of edges that had an edge connecting that particular individual to that particular board. Then, we appended this list to the above-mentioned edges table. In all, we created 18 additional nodes representing organizations, and 67 edges connecting these organizations to 34 unique individuals. Figure 3 represents the graph that resulted when the nodes representing individuals and the nodes representing organizations were combined with the edges representing family relationships and the edges connecting individuals to organizations.

A visual inspection of the graph in Figure 3 shows a modest number of individuals who are connected neither to an organization nor to another individual. Furthermore, we see that the graph contains many family groups—

46 The nodes created include: Township Supervisor, Chippewa County Board of Supervisors, Constable, Health Officer, Chippewa County Board of Supervisors Committee on the Poor, Taxpayer Committee, Building and Grounds Committee, Dock Committee, Election Board, Sugar Island Township Government, Road Work, Justice of Peace, People's Party, Progressive Party, Communists, County Sheriff, Pound Master, and Highway Commissioner.

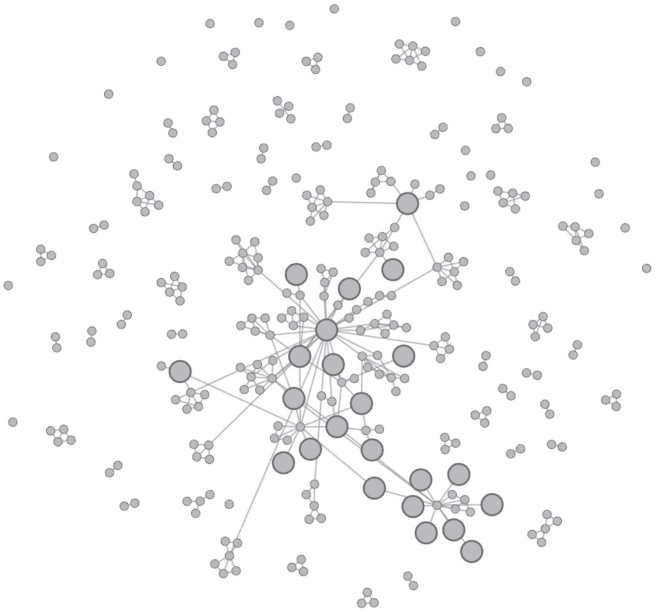

**Figure 3:** Social network graph depicting Finnish individuals on Sugar Island (small nodes) and select organizations (large nodes). The edges connecting individuals to each other are based on nuclear family relationships. The edges connecting individuals to organizations signify that a specific individual participated in a specific organization.

ranging in size from two to six individuals—that are not connected to any organization nodes. Although additional data may eventually show these individuals and family groups to be of significance to the story of the Sugar Island Finns, the limited data used in this model suggests that these individuals and families did not have particular importance. So, for simplicity's sake, we created a modified graph by removing the nodes representing unconnected individuals and the nodes and edges belonging to family groups that were not connected to an organization node (see Figure 4).[47] Another

47 The motivations for doing so are first, this is the only section of the graph that contains organization nodes and where family groups are connected to one another; in other words, that is where the action will be. Second, algorithms for producing graph metrics sometimes produce more meaningful results after

way to state this is to say that we removed all nodes and their related edges that were not part of the graph's large "connected component."[48]

**Figure 4:** A graph representing the Finns of Sugar Island with connections to select political or municipal organizations.

Once we trimmed the graph to its large connected component, we ran the above-mentioned four algorithms for computing graph metrics: degree centrality, closeness centrality, betweenness centrality, and Page rank. One of the most salient features of this graph is that it contains a "hub," which is a node that has a number of edges that is much higher than most nodes have.[49]

removing orphaned nodes or small sub-networks that are unconnected to larger networks. Third, when dealing with large quantities of data, it is sometimes helpful to remove superfluous data from the model to prevent researchers from becoming deluged with data that is often insignificant.

48 In layperson's terms, a connected component is a sub-part of a graph in which any two nodes are connected to each other by paths, but without having the nodes in that sub-part be connected by paths to any other nodes outside that sub-part.

49 The "road work" node has a degree of 25, whereas the average degree of the nodes in the full graph is only 2.3.

This hub is the node representing the "road work" activity. This node occupies the central position in the spatial layout of the graph and will score high in all the metrics, largely because its large number of edges facilitates and optimizes traversal of the graph.

*Degree centrality*: The degree of a node is simply the number of edges it has. The intuition behind this metric is that important nodes will have many edges and, thus, a high degree. The top-scoring nodes in our model are the nodes representing the "road work" crew (25), Frank Aaltonen (14), Emil Hytinen (12), August Saari (10), Robert Koski (8), and the Sugar Island Government (8). In some ways, this is not surprising. The road work crew and the Sugar Island Government allowed many people to participate. We know that Frank Aaltonen was an influential person on the island, so it is not surprising that he served in ten organizations. Aaltonen also had a wife and three children. His family connections plus his organizational connections provided him an impressive score for degree centrality. Similarly, Emil Hytinen and August Saari headed large households and served in multiple organizations. Furthermore, Emil Hytinen and August Saari appeared on all three censuses, and Robert Koski was the husband of Hilda Koski and the head of the Koski family, some of whom appeared on all three censuses.[50] Thus, there is accumulating evidence that these long-resident individuals and their families may have been important actors in the Finnish community of Sugar Island. (See Figure 5.)

*Betweenness centrality*: This metric finds the shortest path (if a path exists) between all pairs of nodes and counts the number of times each node appears on a shortest path. Here again we have the "road work" node scoring the highest, followed by the nodes representing Waino Soini, the Communist Party, Emil Hytinen, and Frank Aaltonen. Soini and Hytinen score higher than Aaltonen with this algorithm largely because they participated in the road work organization. The "road work" node is a common stop on the shortest path between nodes because it had broad participation and because a significant percentage of family groups who were organizationally active had a member participating in road work. It is interesting to note that Waino Soini, the Communist organization, and Emil Hytinen scored higher than Frank Aaltonen, whom our traditional sources suggest

50 Hilda Koski appeared on three censuses, but Robert Koski died between 1920 and 1930. She stayed on Sugar Island with her children and became one of the few Finnish female heads of household and the only female farmer.

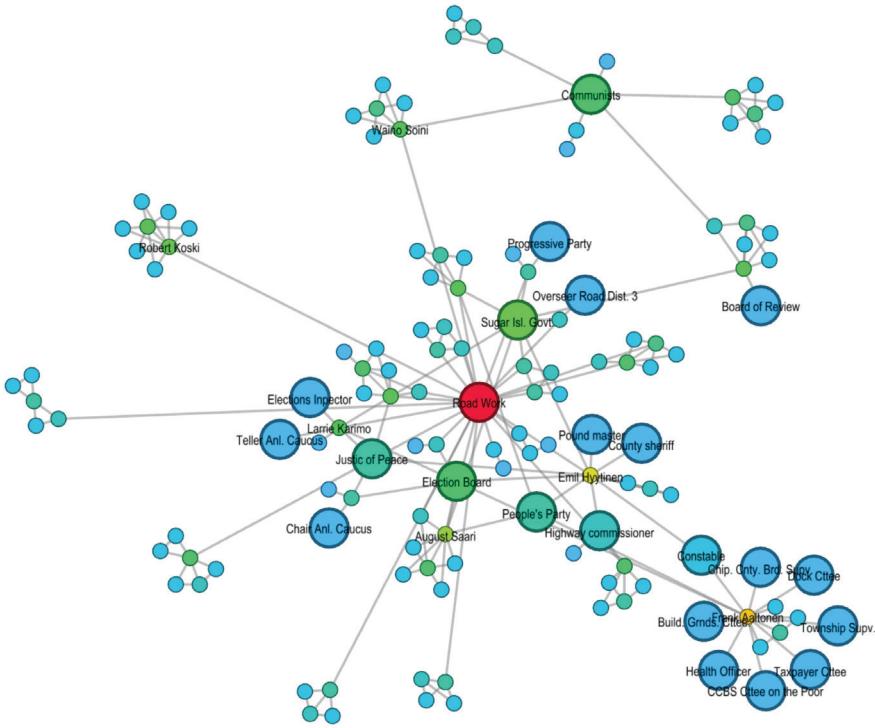


**Figure 5:** The "degree centrality" algorithm applied to the graph in Figure 4. Colors are arrayed on a spectrum where red represents high values and blue represents low values.

is the preeminent Finn on Sugar Island. A visual inspection of the graph shows that, although Aaltonen served in many organizations, most of the organizations were held exclusively by Aaltonen. That is, most of the organizations Aaltonen served on did not have edges connecting to other Finns. On the one hand, this suggests that Aaltonen was a bit of a peripheral actor because the organizational positions that he held were peripheral; on the other hand, perhaps Aaltonen was so popular and politically powerful that he dominated many organizational positions and, ironically, his lower-than-expected betweenness score might actually reflect remarkable political power. (See Figure 6.)

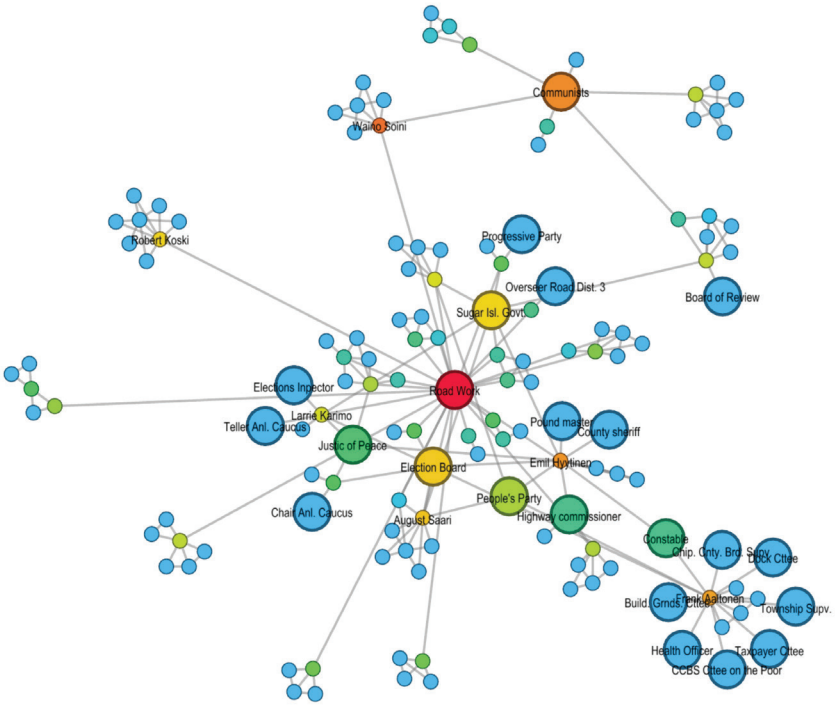


**Figure 6:** The "betweenness centrality" algorithm applied to the graph in Figure 4. Red represents high values and blue represents low values.

*Closeness Centrality*: This metric calculates, for each node in the graph, the shortest path to each other node in the graph, then sums the lengths of these shortest paths, and returns the reciprocal. The best five scores are the nodes representing road work, Emil Hytinen, August Saari, Lauri Karimo, and Emmanuel Syrjala. Frank Aaltonen, surprisingly, ranks an unimpressive 59th on a list of 137 nodes. Aaltonen's score is low not only because he is not directly connected to the "road work" hub, but also because the shortest path from the Aaltonen node to the "road work" node goes: (Frank Aaltonen)→(Election Board)→(August Saari)→(Road Work). In other words, Aaltonen is three "hops" away from the "road work" node. Another point worth noting is that, in all the family groups that have a member par

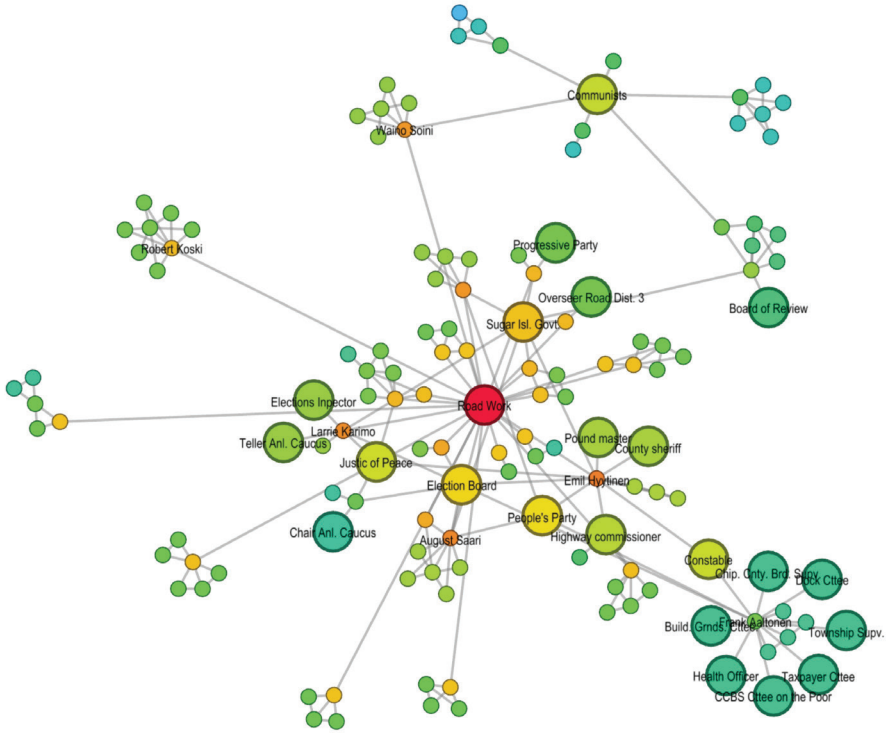


**Figure 7:** The "closeness centrality" algorithm applied to the graph in Figure 4. Red represents high values and blue represents low values.

ticipating in the "road work" organization, that participating member has an elevated closeness centrality score. To put this in layperson's terms, a family member connected to the hub can act as a conduit between the family group and the outside world. (See Figure 7.)

*Page rank*: This algorithm repeatedly traverses a graph by entering it at random points and tries to detect the most important or influential nodes. Not surprisingly, the "road work" organization node scored the highest. It was followed by the nodes representing Frank Aaltonen, Emil Hytinen, August

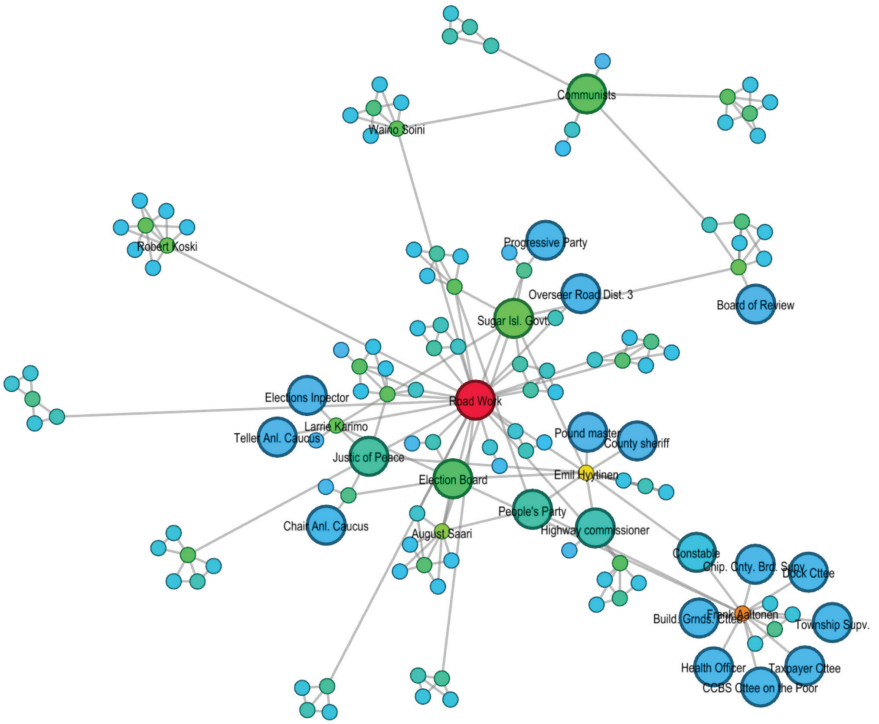


**Figure 8:** The "Page rank" algorithm applied to the graph in Figure 4. Red represents high values and blue represents low values.

Saari, and Robert Koski. Again, no real surprises with the top five scorers, and a visual inspection of the graph—colored to reflect Page rank scores—suggests that this algorithm produced a reasonable evaluation of the nodes and their relative importance. (See Figure 8.)

Running these algorithms confirmed some previous expectations, but even in this relatively small population demonstrated that this method can produce important new information and point to new research directions for studying historical populations.

**Conclusions**

Sugar Island provides a geographically-bounded population that includes both Finns and non-Finns; consequently, it is an ideal environment to study in-migration and community formation over time. Furthermore, Sugar Island was not a typical Finnish immigration community. Frank Aaltonen noted that Finns needed to be free from the oppression of the mines, and Sugar Island was supposed to provide the freedom to farm or find labor freely. Through our network model, we can see that Finns indeed found a place within the society very quickly; they found employment and became politically active. Further research and network analysis will help us investigate whether this community lived up to these almost utopian ideals set forth by Frank Aaltonen.

The census returns provide an abundance information that will help us reconstruct the Sugar Island community across the span of eight decades. Together with additional sources, such as other local history monographs, local newspaper articles, and land records, we will be able to discover and analyze many important trends in the Finnish and broader community. As discussed above, by analyzing census returns we can already see that Finns were quick to find employment and home ownership. Furthermore, while the percentage of Finns involved in agriculture remained constant, there was increasing sophistication and diversity in the types of jobs held by Finns. We also believe that by studying the activities of Frank Aaltonen and a few other Finnish migrants, we will learn much about the processes involved in the "founding" of migrant community.

We are confident that network modeling will enable us to understand the historical communities on Sugar Island. While acknowledging that our experimental model is not yet recreating the robust networks of the Sugar Island community, it demonstrated the power of this method and we gained important insights into building our datasets and applying social network analysis to historical data. On a general level, we believe that the federal census returns are very useful documents for building our network model. The census returns provide a reasonable—though not exhaustive—listing of the people we want to study and, for our model, it was relatively easy to track specific individuals across multiple censuses. Furthermore, because the censuses contain other types of information about a person's birthplace, citizenship status, languages spoken—and, on the 1920 census—the birthplaces and native languages of a person's parents, we were able to make reasonable choices about who would be considered Finnish. We were

pleased that our graph model accorded a high level of importance to Frank Aaltonen. We expected to see this, based on reading of secondary sources. We were also excited to see that some of our graph metrics pointed to Emil Hytinen, August Saari, Robert Koski, Lauri Karimo, and Emmanuel Syrjälä as being individuals of importance, too. This indicates that, even though the early years of the community are described as the "Aaltonen Era," the story is more complicated. Moving forward, we will try to identify other social and political leaders on Sugar Island—both male and female, formal and informal. And, we will try to compare and contrast Frank Aaltonen's leadership paradigm with leadership paradigms exemplified by other Sugar Islanders.

While building this model we could see, via simple visualizations, a representative social structure of the Sugar Island Finns. When social networks such as sports clubs, choirs etc. are introduced to the more nuanced dynamic model we will build, a fuller picture of the evolution of the Finnish community will emerge.

We also became aware of some of the limits of our experimental model. One obvious limitation is that the graph we built was a *static* graph—as opposed to a *dynamic* graph—that effectively combined information specific to different points in time into a single, all-inclusive graph. More specifically, it included all the Finnish people living on Sugar Island according to the 1920 census, the 1930 census, and the 1940 census. We know that not all of the Finns were present on Sugar Island for that twenty-one-year period bookended by the 1920 and 1940 censuses. For example, Frank Aaltonen was living on Sugar Island at the time of the 1920 census, but he left the island in 1929. However, he appears in this graph model together with people who appeared only on the 1940 census. Thus, the model gives the false impression that Aaltonen lived on Sugar Island concurrently with these people. Building a dynamic graph would resolve many of these problems, as would building highly tailored graphs designed to answer specific research questions.

Furthermore, our experimental graph model was perhaps most remarkable for what it did *not* include. By including only Finns resident on Sugar Island in 1920, 1930, and 1940, it left out the above-mentioned school teacher Sylvia Kuusisto; it is likely that other Finns were similarly excluded. Our model did not include any of Sugar Island's non-Finnish population, some of whom would have been important participants in the lives of

the Sugar Island Finns. In the future, we will include other ethnic groups, including the Chippewa. We are currently building a model of the entire community based on census returns from 1860 to 1940 and the initial investigation promises to yield interesting new insights into the structures of the Sugar Island community and the networks between various ethnic groups. Furthermore, the organization nodes and the node representing participation in "road work" represent a very small portion of the social and political lives of the Sugar Island Finns. Much additional information, such as religious organizations and women's organizations, should be gathered, modeled, and analyzed. Similarly, other than the fact that all individuals in the model lived on Sugar Island, there is no geospatial information in the model. Fortunately, we can overcome these limitations and build models that are more highly nuanced and more robust.

Another way to critique our experimental model is to recognize that we built it based on readily available data. In other words, we did not build our model to answer specific research questions. Instead, we built our experimental model because we wanted to gain some trial-and-error experience with a simplified model so that, as we move further into our grant period, we can develop models that are much larger, more sophisticated, and more richly populated than our current model. Furthermore, in building this experimental model, we have developed a research itinerary of sources and information we want to seek out and incorporate into our project. Thus, our model, even though not by any means a final model, already showed promising insights. It also pointed to new research directions, using either social network analysis or traditional historical methods. Building this initial model helped us to generate new ideas on developing innovative and meaningful methodologies for analyzing the historical population of Sugar Island. Thus, this model is in itself a research result that allows researchers to ask new questions and develop it further.

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