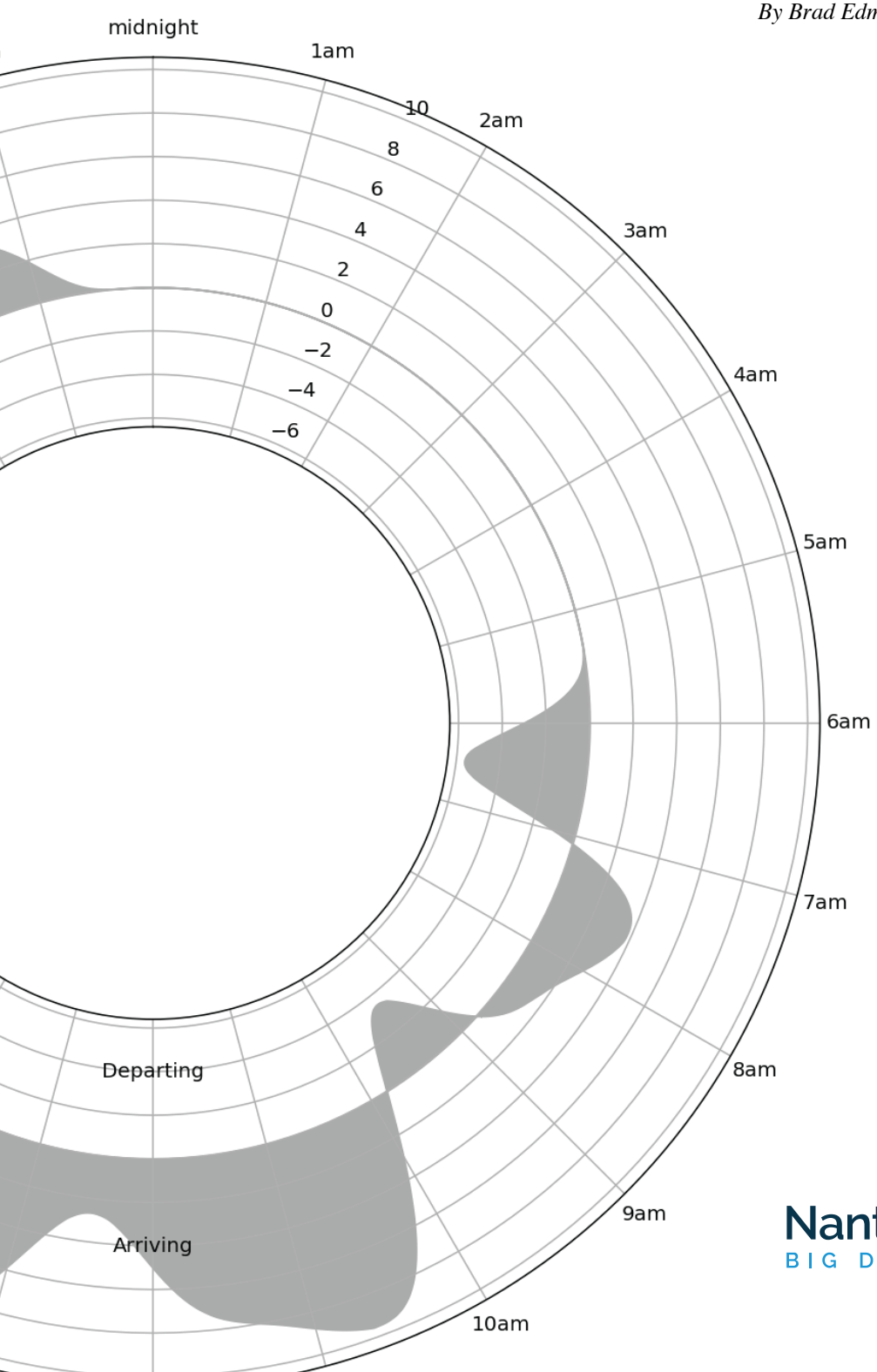
Making It Count

A Data-Driven Look at Nantucket's Dynamic Population

By Brad Edmondson and the Nantucket Data Platform team



Nantucket Data Platform

BIG DATA FOR A SMALL ISLAND

Key Findings

IN THE FALL OF 2016 a group of Nantucket residents gathered to talk about their beloved community. They were surprised and a little dismayed to learn that they could not describe its population clearly.

That discussion generated the Nantucket Data Platform, an energetic collaboration between data scientists, demographers, data visualizers, and writers, supported by local leaders from businesses, nonprofit groups, and government. Over the last year, the NDP team used wide-ranging sources and innovative techniques to build what *N Magazine* calls "the clearest statistical model of the island ever created."

After receiving support from ReMain Nantucket, the team spent a year working on the answer to two seemingly simple questions: what is the island's population, and who are these folks? This paper reports on the first comprehensive estimate of Nantucket's daily population.

The study profiles Nantucketers by dividing them into five groups:

- ***Permanent residents:*** the latest US Census Bureau estimate says that there are 11,229 permanent residents of Nantucket, but the NDP estimates with high confidence that the real number is 17,200. Miscounts like these are costly. The higher number could add millions in federal aid to the Town's budget.
- ***Seasonal residents:*** this group adds about another 11,000 people during warmer months, although they are not all on the island at once.
- ***Seasonal workers:*** this group numbers about 6,590 residents in July.
- ***Commuting workers:*** this small but important group adds at least 365 people every workday throughout the year.
- ***Visitors:*** the NDP has high confidence that visitors made 495,000 trips to Nantucket in 2017, including more than 100,000 in August alone.

NDP's profiles go far beyond simple population counts, offering exciting new possibilities for local businesses, nonprofits, and local government. A few observations:

- Nantucket's overnight population can change dramatically from day to day. It grows 25% over Memorial Day weekend and declines by 20% over Labor Day weekend.
- Domestically, visitors come from 3,300 Zip Codes in all 50 states.
- In 2017, the quietest day of summer was the Wednesday after Memorial Day. The busiest was the Saturday when the Boston Pops and the Beach Boys were in town.
- Visitors from Connecticut prefer Cisco and Surfside beaches, but those from Atlanta go to 'Sconset.

Introduction

How many people are on Nantucket today? How many were here last Thanksgiving at 6 am, noon, and 6 pm? What brought them here, and where did they come from? How does each group spend its time and money?

Answers to these questions could improve the efficiency of local government, assist nonprofits that enhance the community, and help businesses become more profitable. Previously, Islanders could only guess the answers. Now the Nantucket Data Platform (NDP) is using science to figure it all out.

When people talk about "big data," they mean new kinds of analysis made possible by faster computers, improvements in storage, and the massive volumes of data mostly generated by online activity. NDP is working to bring the power of big data to a small island.

NDP is a group of Nantucket business people, social scientists, and donors who have the energy of a Silicon Valley start-up, and their appetite is voracious. They use Nantucket's annual Town Census, but also sales figures from local businesses, ferry traffic counts, data purchased from private vendors, and even the tons of municipal solid waste processed at the venerable Nantucket Dump.

NDP's first project is producing a day-to-day estimate of Nantucket's population, and the following pages summarize their methods and sources. They will be explained in more detail in an upcoming academic paper written by the NDP team and sponsored by ReMain Nantucket.

The study is ground-breaking demographic research, but its usefulness goes far beyond academics. Most American communities rely on the Census Bureau for population counts and profiles of residents' demographic characteristics. But this source is poorly suited to places like Nantucket because the island's population is not static. It is a year-round procession of people who come and go via air or sea, with occasional help from the obstetrician and the undertaker.

Nantucket's "effective population" changes several times a day. These changes can be dramatic, because the grand total encompasses all people who are present on the island, not just permanent residents. Impermanent members of the community fuel the local economy and drive human and public-service demands.

NDP's long-term goal is to assemble actionable information and place it in the hands of local citizens, so they can replace guesswork with evidence-based decisions.

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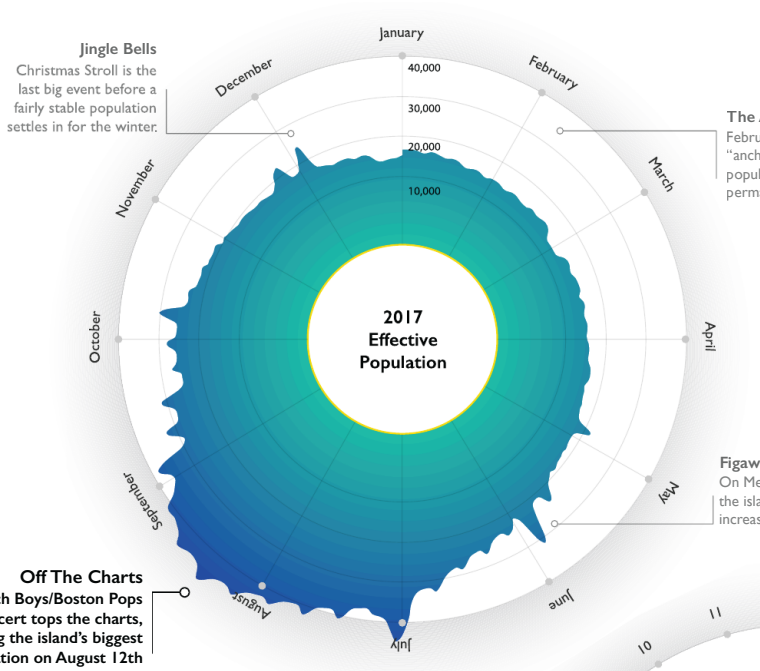
NEW EVIDENCE

The traditional way to count a transient population is to look at "symptomatic indicators" of human presence. These might include the solid waste tonnage at the town dump, or the electricity registered by residential utility meters. Each indicator is like a statistical contrail, roughly scaled to the number of people who are present in a specific place. Twice as much garbage tossed, or electricity used, implies twice as many people.

Symptomatic indicators like these are often all a researcher has to work with, but they are imprecise. Research shows that visitors can produce significantly more solid waste than permanent residents, for example, so the garbage from a Saturday in July doesn't have the same impact as it does on a Tuesday in March. And the use of electricity is dramatically affected by the use of air-conditioning or the number of devices recharging, and other factors that don't relate to how a population might have changed in the preceding days or months.

In many communities, including Nantucket before NDP's recent research, old-fashioned symptomatic indicators might be the only data available. Fortunately, NDP's work has created more precise ways to count people on Nantucket because they can only arrive and leave the island by boat or plane. The NDP collected and analyzed trip-level data from the island's two main ferry companies, along with publicly reported monthly passenger data from smaller ferry companies and airlines. The result was a detailed portrait of the ebbs and flows of Nantucket's population, with day-to-day changes that are dramatic. In 2017, for example, Nantucket's overnight population increased by 25% during the Friday and Saturday of Memorial Day weekend. During Labor Day weekend, 20% of the population left.

Brad Edmondson, former editor of American Demographics*, is a writer based in Ithaca, New York.* *In preparing this article, he relied on contributions from Nantucket Data Platform colleagues Alan Worden (founder), Victoria Powers (technologist), Peter A. Morrison (chief demographer), Anna Tapp (data scientist and author of the appendix on methods), David Lockhart (data scientist), Joe Smialowski (past-chair of the NDP advisory board), and data miners Kristie Ferrantella and Samantha Reis. The NDP team owes thanks to its team of academic authors and reviewers, Dr. David A. Swanson of the University of California–Riverside, Dr. Jeff Tayman of U.C. San Diego, Dr. Warren Brown of Cornell, and Dr. William Clark of UCLA, all extensively published applied demographers or geographers. Visualizations were developed by PJ Hardas, Cam Mullins, and Brandon Martin-Anderson. NDP's technical paper describing the Nantucket Effective Population Study is undergoing revision by Morrison, Swanson, and Tayman for submission to Population Research & Policy Review. Address technical questions to petermorrison@me.com. For general inquiries, contact Alan Worden, alan@nantucketdataplatform.com.*

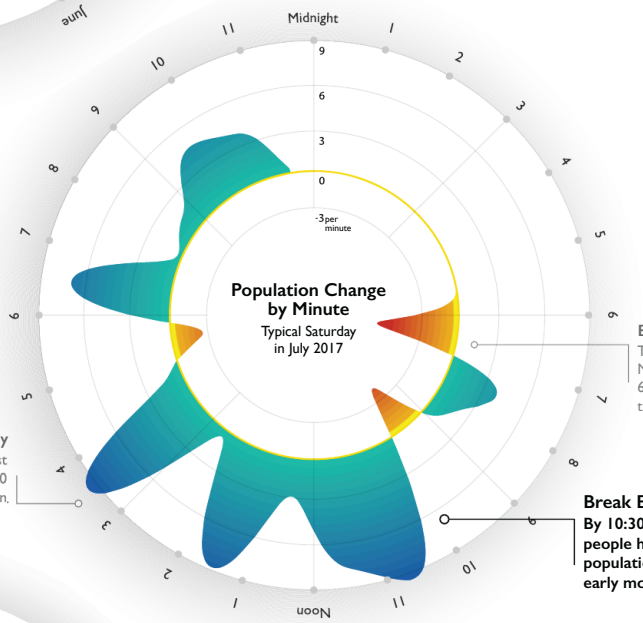


Jingle Bells
Christmas Stroll is the last big event before a fairly stable population settles in for the winter.

The Anchor
February represents the "anchor month" with a population of 17,200 permanent residents.

Figawi Surge
On Memorial Day weekend the island's population increases over 30 percent.

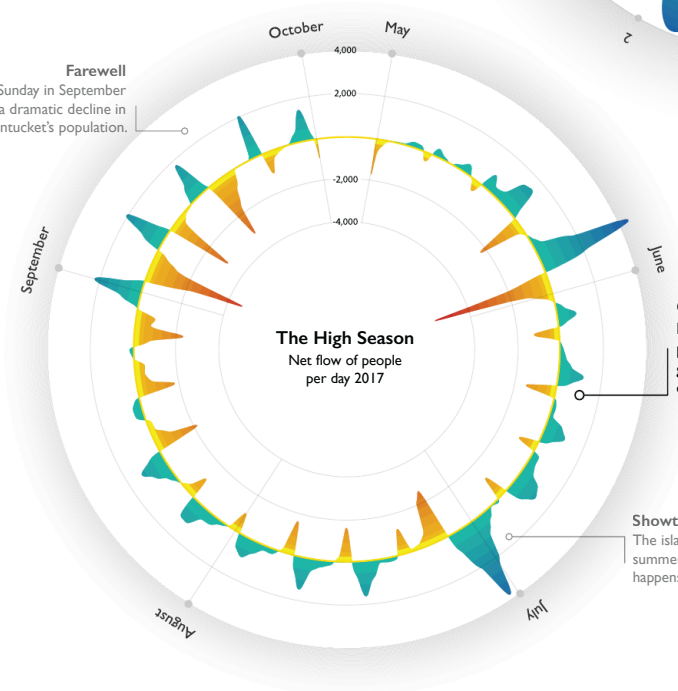
Off The Charts
The Beach Boys/Boston Pops concert tops the charts, producing the island's biggest daily population on August 12th at 7:00 in the evening (46,580).



Early Riser
The day begins as Nantucketers board the 6:30 Steamship ferry to the mainland.

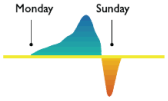
Busy Busy
The greatest activity is at 3:30 in the afternoon.

Break Even
By 10:30, the net inflow of people has erased the population deficit from the early morning.



Farewell
Every Sunday in September shows a dramatic decline in Nantucket's population.

Coming...Coming...Gone
Most weeks suggest the same pattern. The population increases gradually and resets with a dramatic outflow on Sunday.



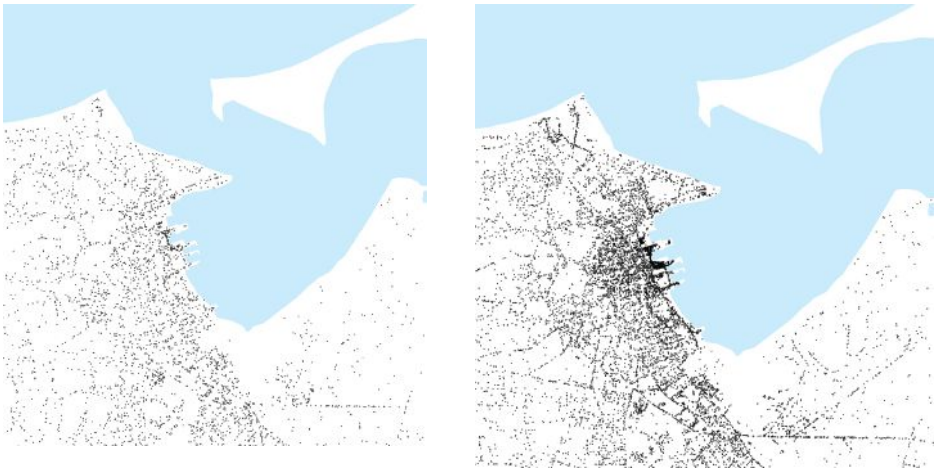
Showtime
The island's biggest summer population flow happens on July 3rd.

The NDP also employs a new data source that vastly increases the possibilities of using symptomatic indicators for population estimates. The data come from smart phones running applications that give out directions, such as Yelp or Google Maps. A phone sends geolocation signals to the computers that run those apps, and those signals can be used to track the phone's geographic location. StreetLight Data, a private company, uses a proprietary algorithm and methodology to turn trillions of these anonymous "pings" into useful data.

StreetLight is especially well-suited to use on Nantucket because of the Town's geographic isolation. It can count devices as they pass through gates at the ferry docks and airport. It does this by "geofencing" each location. This means creating a virtual geographic boundary that enables software to flag any mobile device entering or leaving a given area. The area could be anywhere above a certain minimum size, such as a ferry terminal, an airport, a downtown museum, a group of addresses, or even a stretch of beach.

Using mobile devices as proxies for people vastly increases the possibilities for estimating population sizes and patterns of movement. StreetLight's reports allow clients to know the origins, workplaces, and travel patterns of people who use apps that deliver anonymized data. The company assigns home and office locations based on where the devices usually spend their days and nights. It does not provide any information about an individual device or its owner, but only reports an index value showing the relative sizes of crowds. For example, StreetLight might tell the NDP that the number of people who passed through Nantucket's airport at noon on a certain day was 150% of the number who passed through at 6pm.

The NDP broke new ground when they started comparing Street Light indices to trip-level passenger counts. They found a predictable relationship, and tests showed that the relationship was highly reliable. By combining the two sources, they learned to produce highly accurate population counts. Then they took it further.



MAPS SHOWING POPULATION CHANGE ON A TYPICAL SATURDAY IN JULY 2017
Mobility data placed on simple maps showing the intensity of population movement from morning (left) to evening (right) on a typical Saturday in July 2017.

THE PERMANENT OR "ANCHOR" POPULATION

Combining sources allows the NDP to make high-confidence estimates of the number of people present on Nantucket on any given day, and their movement around the island. It is far more difficult to know and understand why people come here—but it is also worth the effort. To estimate each population segment, the NDP must first understand each segment's distinctive demographic characteristics, marketplace behavior, and even their attitudes. These profiles can yield valuable insights for local businesses, nonprofits, and government.

The NDP distinguishes five types of people who may be present on Nantucket Island: permanent residents, seasonal residents, seasonal workers, commuting workers, and visitors. Permanent residents are people who regard Nantucket as their usual place of residence--where the adults pay taxes and register to vote. This segment includes Nantucket's year-round workforce, their children and other household members, and the island's resident retirees. Permanent residents are the only group that has a well-established partial count already in place.

The NDP analyzed the Town's official Street List and its annual Town Census as a starting place for its estimate of the island's permanent residents. The Street List is a headcount—a database of sorts—maintained by Nantucket's Town Clerk. It is a public document that publishes a list of the names and addresses of all known Town residents aged 17 and older. Behind the public document is a confidential "complete extract" which also includes residents under age 17 and several hundred others whose addresses remain confidential.

The Street List is updated continuously, based on daily public transactions, and annually by the Town Census. The Town Clerk's annual census form is mailed to every known household address in early January. The form asks residents to verify and update the household information currently shown on the Street List. According to the Clerk, about 80% of forms delivered to Nantucket addresses are returned by late April (the postal service immediately returns some forms as "undeliverable"). The other 20% are classified as recipient households who did not respond.

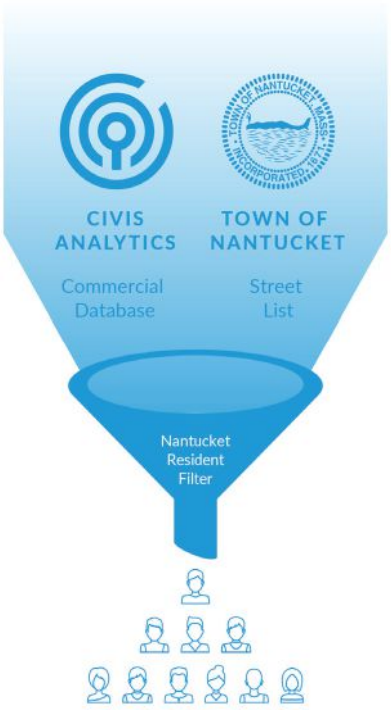
The NDP obtained the public version of Nantucket's Street List for September 2017. It included all nonconfidential adults in the register at that time, which totaled 10,798. It's a solid starting point but, because of non-response rates, it is likely incomplete. To find adults who live on the island permanently but who did not respond to the Town Census, NDP matched the Street List to a commercial database from Civis Analytics, a private data company whose respected, proprietary, and regularly updated database of 250 million American adults is compiled from hundreds of publicly available sources and reputable data vendors. The matching led to an estimated number of 14,190 adult residents.

Children are excluded from both the Street List and Civis databases due to privacy policies. Using

various demographic methodologies described in detail in the Appendix, the NDP estimates that there are 0.21 (number rounded) children for every adult on the island. Adding that estimate of children to the count of adults yielded a mid-year 2017 estimate of 17,200 (rounded from 17,160) permanent residents.

This does not mean that 17,200 people are present on Nantucket year-round. Surely, that number is lower, since an unknown number of permanent residents stay in warmer places during colder months. Although some "snowbirds" qualify as seasonal residents of Florida or Costa Rica, they vote and pay taxes on Nantucket. The NDP intends to estimate their numbers using the US Postal Service's Change of Address database.

17,200 residents



Comparing the NDP estimate of 17,200 to the most recent federal Census of 11,229 shows a wide gap between the two sources. Why the disparity? One possibility is that the Census Bureau's methodology for estimating population is ill-suited to Nantucket's population growth. After each decennial census, the Census Bureau extrapolates population based on its estimate of housing units. On Nantucket the number of housing units is growing, but the average number of occupants per household is growing even faster. The island's housing stock is inhabited more densely, perhaps much more densely than it has been. The Census Bureau's methodology does not account for the island's increasing density.

These differences surely matter. A 2020 Census approximating the NDP estimate could funnel millions of additional dollars of state and federal aid into the Town's budget. Also, a town with nearly 6,000 uncounted residents might not hire enough social-service and health-care workers to serve all its residents. Or make good estimates for an upgraded sewer system. And so on.

FIVE BUCKETS

The Town Street List provides a firm foundation for estimating the number of permanent residents. It is more difficult to estimate the number of seasonal residents, seasonal workers, commuting workers, and visitors, because simply counting ferry and airplane passengers does not reveal why a person is making a trip. To count those groups, the NDP turned to alternative methods.

The NDP's calculations of the five population segments assume that each segment is defined comprehensively, measured reliably, and does not overlap with another segment. Inevitably, though, some people will fall through the cracks. For example, Nantucket is home to an unknown number of people, many of whom are recent immigrants, who do not have cars, banking relationships, cell phone plans, or other statistical "fingerprints" that Civis, StreetLight, and the Town Clerk use to understand who's here. These Nantucket residents are present but difficult to count.

It can also can be difficult to distinguish a visitor from a worker or a seasonal resident because each may behave like the other. A seasonal homeowner who briefly visits Nantucket only when her home isn't rented may be mistaken for a tourist in the NDP's data. The breadwinner of a seasonal homeowner family may spend only summer weekends in residence, so he or she may be mistaken for a weekend tourist. StreetLight data is based on patterns of behavior, so brief, randomly-timed visits by homeowners can't be separately identified by this source.

The NDP's algorithms will never be perfect, but putting every person into the right "bucket" is not the group's true aim. The point of the exercise is the learning that emerges during the quest. For example, the group has produced a model, based on visitor and weather data, to forecast what percentage of weekend hotel bookings and dinner reservations will cancel on short notice. Each incremental improvement in the estimates yields valuable insights.

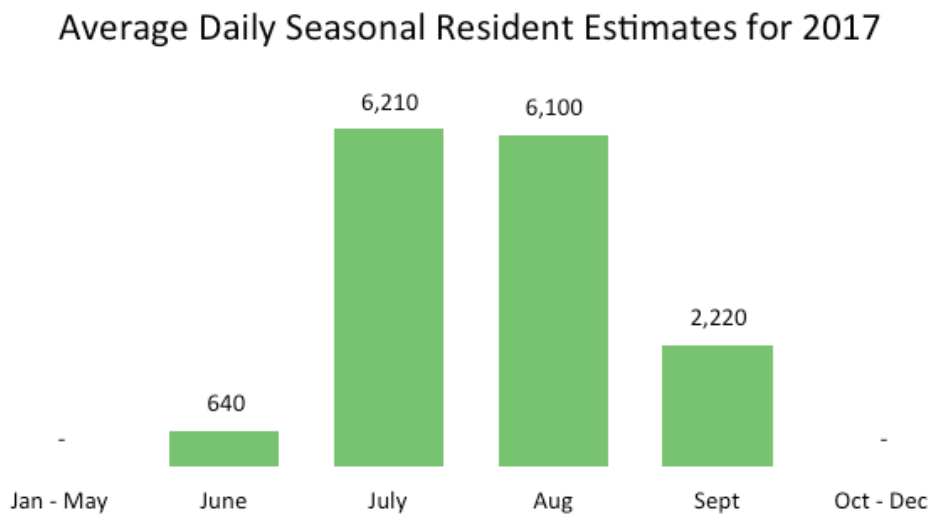
SEARCHING FOR SEASONAL RESIDENTS

Most seasonal residents are second-home-owning taxpayers and their families. This segment also includes tenants who rent private homes and other long-term accommodations. The typical "season" runs from about mid-May through mid-October. In our definition, "seasonal" means "for ten or more days" and/or "repeatedly."

The NDP's estimate of seasonal residents is derived from the Town Tax Assessor's database. In 2017, the Assessor mailed residential property tax bills to 5,149 addresses bearing off-island Zip Codes. The NDP gave these addresses to Civis, which found 593 cases where the owner's behavior matched the behavior of a permanent resident. This finding decreased the list to 4,556 parcels. After removing duplicate owner names, the NDP determined an estimate of 4,254 second home owners, including 602 limited liability companies or trusts and 82 owners whose property tax bills are sent overseas.

Next, the NDP calculated the average household size of seasonal residents' off-island Zip Codes (using Census Bureau data) to derive a preliminary estimate. They found that if every seasonal resident and all members of their immediate households were on the island at once, the total would be just under 11,000 persons, including at least 197 who live outside the United States.

When are these seasonal residents actually present on Nantucket? Using StreetLight, the NDP geofenced second homes in areas of the island where there was both enough activity and sufficient home spacing to produce reliable data: Harbor South, Monomoy, Shimmo, Siasconset, Surfside, and Tom Nevers. These areas account for only about one-third of second homes, however, so the results were multiplied to estimate the total activity for second-home households. The data did not register enough activity to produce reliable data for off-season months (October to May). As expected, it saw activity in June that peaks in July (at 6,210) and August (6,100) and declines steeply in September.



The season for seasonal residents lasts four months.

These estimates capture only second homeowners and household members who stay long enough for

StreetLight to recognize Nantucket as the place where their mobile device usually spends the night. This causes a two- to three-week delay in their detection. For this reason, seasonal residents who arrive in late May or early June might not show up in the data until July.

The estimates also omit tenants who rent rooms or cottages from permanent residents for several weeks or months, and they fail to capture second-home owners who use their residences between October and April. The NDP will test several new methodologies for counting seasonal residents in the coming months.

TWO KINDS OF WORKERS

Many jobs on Nantucket pay far better than a similar job would on the mainland. The reason is Nantucket Sound, which makes it much harder for employers to persuade people to report for work. The island's high cost of living and geographic isolation creates two distinct population segments: commuting workers and seasonal workers.

Commuting workers live on the mainland year-round. Some of them spend several hours commuting every day, while others find local housing on weeknights that is often provided by employers. Many commuting workers are plumbers, electricians, and other types of skilled construction workers.

Seasonal workers usually stay on Nantucket from April through September, filling thousands of temporary jobs in hospitality, landscaping, and retail. Some seasonal workers also stay in employer-provided housing, but many of them find lodging on their own.

Although commuting workers are far less numerous than seasonal workers, both groups are essential to the island's economic and social life. They also add to the demand for public services, because anyone can dial 911 or seek care at the hospital's emergency room. The NDP's preliminary analysis of ferry passenger patterns identified about 365 year-round commuting workers who use the ferry. The team knows anecdotally that a smaller number of workers commute by air taxi or chartered aircraft, but this group remains uncounted for now.

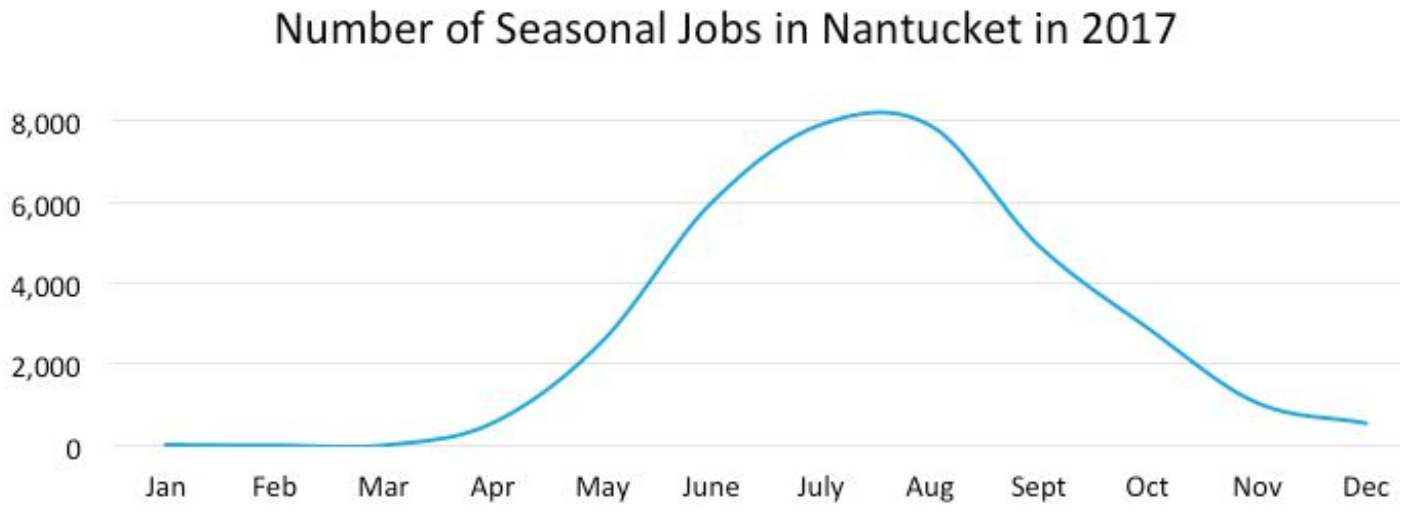
Estimating the numbers of commuting and seasonal workers poses knotty challenges, but two federal data sources offer partial insights. The Bureau of Labor Statistics (BLS) provides monthly employment data for most industries on Nantucket, and the Bureau of Economic Analysis (BEA) reports annually on all Nantucket workers by industry.

The NDP's method for analyzing these datasets is straightforward. The BLS shows the total number of jobs available on the island month by month, along with the size of the work force and the number who are unemployed. The NDP estimates the island's permanent labor force at 9,754, which is also their count of the total number of permanent residents between the ages of 18 and 65. Subtracting that rough estimate of the permanent labor force and the provisional estimate of 365 commuting workers from the total number of jobs leaves the remainder, which is the number of seasonal jobs (and, presumably, job holders). The data show the

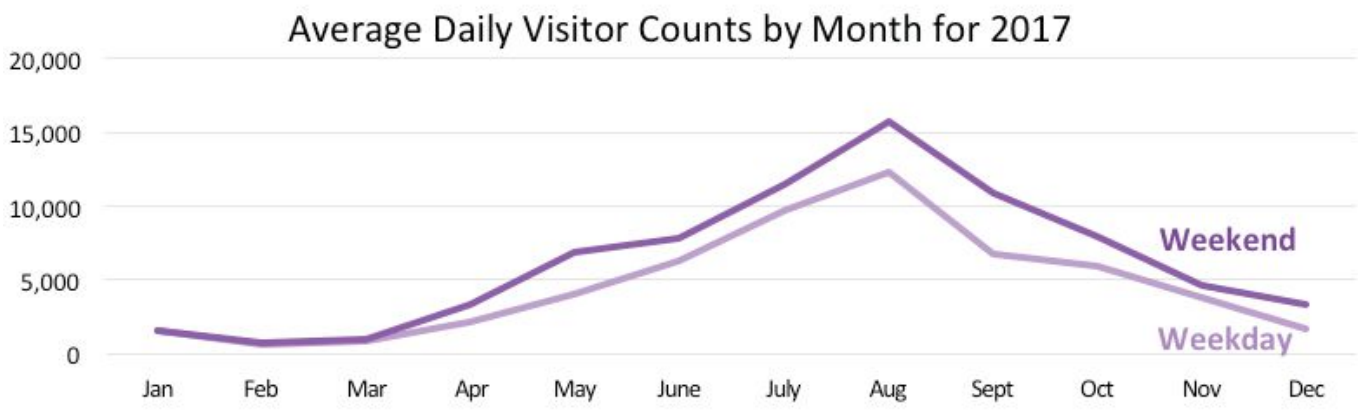
number of seasonal jobs increasing rapidly from May (2,570 workers) to June (5,990), peaking in July (7,920) and August (7,910), then declining through September (4,930) and October (2,890).

The BLS and BEA data are reliable and easy to understand, but they do not fully capture the complexities of Nantucket's work force. Many of Nantucket's seasonal workers hold multiple jobs and spend nearly every waking hour at work. Yet BLS and BEA data do not distinguish part-time workers from full-time workers and multiple job holders. Federal data also exclude holders of J1 visas, a non-immigrant category issued to scholars, professors, and visitors participating in programs promoting cultural exchange and job training. Many seasonal workers come from overseas and need work visas.

The NDP is interviewing commuting and seasonal workers to better understand their patterns of coming and going, the jobs they hold, and their living arrangements while on Nantucket. The interviews will allow the NDP to do a better job of using StreetLight and other sources to parse the data and distinguish seasonal and commuting workers from visitors.



Seasonal workers show up earlier and leave later than seasonal residents.



The gap between weekday and weekend populations is greatest in May and September.

THE VALUE OF VISITOR PROFILES

Visitors are vacationers or business travelers who stay on Nantucket for one day to 10 days. Some stay at an inn or hotel, while others are guests or short-term tenants at private homes. Their spending contributes enormously to Nantucket's economy, yet as a group they are not well understood.

Local business owners and government workers would love to know how many visitors to expect on a given day (sunny or rainy); how many are here for just a day, for a weekend, or an entire week; where they go when they are on the island; and where they live. Nantucket's decision-makers invest millions of dollars based on the answers to questions like these: Which local media on the mainland will offer the best return to a Nantucket advertiser? When should a tour company offer a four-hour program for day-trippers, and which weeks have enough tourists to offer a two-day or one-week program? A solid visitor profile would take the guesswork out of these decisions.

The NDP draws upon StreetLight data to answer questions about visitors. Comparing StreetLight's distribution patterns with counts of passenger arrivals and departures on high-speed ferries and aircraft allows the NDP to estimate the number of people who come to the island. StreetLight also gives the NDP a good idea of where visitors come from, and also where they go while they are on the island. The NDP's visitor profile can say with high confidence that on a typical July Saturday on Siasconset beach, visitors will outnumber permanent and seasonal residents by two to one. The profile also reveals that visitors prefer the beach in Madaket over Surfside.

The chart on page 11 three shows the number of average daily visitors to Nantucket by month. Weekend populations are consistently higher than weekday populations. They are lowest in February (with 620 weekend visitors on an average day) and March (830) and rise consistently in April (3,280), May (6,770), June (7,750), July (11,450), and August (15,650). The number of weekend visitors drops steeply in September (10,830) and continues to fall through October (7,840), November (4,510), December (3,190), and January (1,520).

The NDP's visitor profile may turn out to be the most useful part of its effective population study. The most exciting aspect of the NDP's visitor data is its ability to chart population changes from day to day, to understand their origins and demographics, and to track visitor movements around the island. It should not surprise anyone on Nantucket that Memorial Day and Labor Day are important population milestones. But it may be useful to know that some weekend days in September and May approach visitor totals found in June, July, and August. And it will certainly be important to know the percentage of visitors to a Nantucket beach, commercial block, or museum who come from Boston, New York, and other places.

The NDP can also create demographic profiles of visitors by combining information from various sources. Its data on visitors is robust enough to answer many different kinds of questions. The team will talk to islanders in the coming months to gather questions and test them in the data, so the community can better understand Nantucket's economic life.

EBB AND FLOW

Nantucket's population ebbs and flows like the tides, reflecting a mix of diverse lifestyles. It is both a high-end seasonal resort community and a miniature port of entry that has traditionally welcomed foreign newcomers seeking brighter futures for their families. The Nantucket Data Platform's effective population study is evidence-based documentation of this dynamic community. It confirms some points of conventional wisdom while challenging others. Even more insights will come as the team refines its methods.

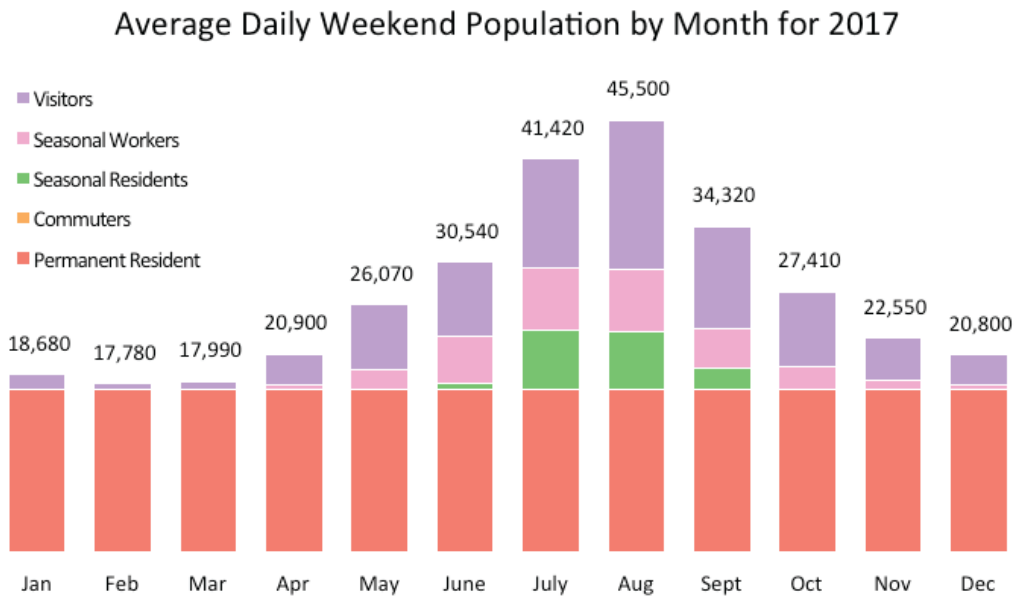
The survey shows that for seven months of the year (October to April), the island's weekday and weekend populations are within 6% of each other—and that in January, February, and March, the weekend populations are actually lower than they are on weekdays, as islanders spend their weekends on the mainland. The biggest bulges in weekend populations occur in September and May, when the populations are 12 and 10% higher than on weekdays.

The island's weekend population is lowest in February and March (17,780). It is highest in July and August (41,420 and 45,500), when temporary residents outnumber permanent ones by 2.5 to one. When the island's population is peaking on an August weekend, just 38% of people on the island are permanent residents. Another 34% are visitors, 14% are seasonal workers, and 14% are seasonal residents. But they are all Nantucketers.

Nantucket's decision-makers are eager for this data and the insights it offers. During the year the NDP team spent producing this study, they were encouraged by the ideas, comments, and enthusiasm of islanders. Now the NDP is entering a new stage, as it goes beyond these population estimates to become a broader community resource. It is time for the community to start using this exciting new tool.

The mission of the Nantucket Data Platform is to bring the benefits of big data to a small island. And it is a small island—so if you have ideas or questions, we're eager to hear from you.

info@nantucketdataplatform.com



In August, temporary residents outnumber permanent ones by more than two to one.

Appendix - General Methods

A1. Transportation Data

In this study, NDP used the most precise transportation data available at the time. We have over 80% of the transportation to and from the island in the form of trip level data provided by major ferry operators. This means that each hour, we know how many people came and went and by what boat. An additional 15% of the data were modeled based on monthly facts and figures or from public agencies which aggregate air data. For that 15% (which includes smaller ferry companies and airport activity), we estimated the daily distribution based on the 80% precise counts.

We believe up to 5% of activity is, as yet, unmeasured. This small percent includes people who come and go from the island outside our major transportation hubs. Examples include private boats docking in the boat basin and uncounted private aircraft. We are seeking further data from airline carriers. Airline data at any level more granular than monthly would improve clarity.

A2. Predicting Counts from Transportation Zones

Trip-level ferry data were acquired from The Steamship Authority (SSA) and Hyline Cruises, detailing passenger counts between Nantucket Island, Martha's Vineyard (seasonal service) and the mainland. Monthly passenger data were acquired for Seastreak and Freedom Cruise Line.

Monthly arrivals and departures were summed for each of Nantucket's two ferry terminals. For the lower traffic winter months, a three-month moving window was used to capture sufficient activity data from StreetLight for analysis. To protect privacy, StreetLight omits data for very small areas or very small activity counts. Their necessary commitment to a minimum threshold of activity imposes limits on what we can know during certain low-activity winter months. To overcome this limitation, we ran our analyses on multiple months at a time to aggregate sufficient data for an output.

Since not everyone uses a smartphone with LBS enabled, StreetLight only captures a sample of people in any zone. Their algorithm takes this sample data and creates an activity index. While not an actual count, this index is scalable. If one result yields an index of 200, and another result yields an index of 400, that ratio shows us that activity in the zone increased two-fold. Since StreetLight is intended to be used for traffic analysis, these counts are not connected to individuals, but to "touches." Doubling the activity could mean the same people entered the zone twice, or it could mean that a new group of people entered the zone.

Zones were drawn in the StreetLight platform that encompassed the entire area travelers inhabit. This definition of "traveler" is meant to focus on people coming to or leaving the island. It excludes family, friends, or taxis picking travelers up or dropping them off. The zones were drawn to minimize overlap with the non-traveler individuals. For ferries, they covered only the places were the ferries approach and dock. Every attempt was made to create a zone to exclude people there merely to pick up or drop off actual travelers arriving or departing (e.g., vans, taxis, residents transporting travelers, etc.). Analyses were run using StreetLight data matched to the same monthly dates captured by the transportation counts, using activity from location-based service (LBS) apps.

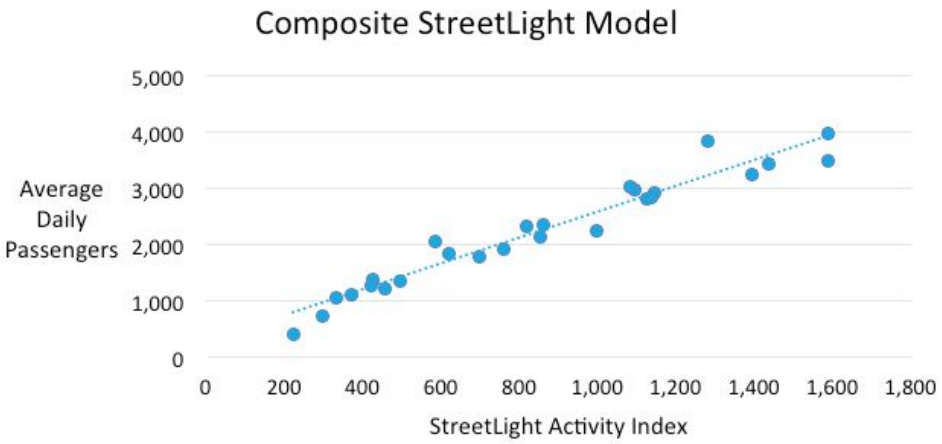
The StreetLight activity index is reported as an average daily rate, so we normalized the transportation counts to an average daily trip count. The average daily count for each time frame was regressed on the activity index to create a predictive model for each transportation zone. Then the entire dataset was analyzed to generate a composite model.

Seasonality variables were included in first regression attempts. None of them proved significant at $p < 0.05$, so we omitted seasonality variables.

We chose to use regression models without a y-intercept. Since the zone activity is intended to be a simple scale, this type of model fit the phenomenon the best. Analyzing each transportation zone individually yielded the following equations:

Hyline Terminals: $y=2.4257x$, $R^2 = 0.97$
SSA Dock: $y=2.8184x$, $R^2 = 0.96$
Composite Model: $y=2.5737x$, $R^2 = 0.93$
Where y = average daily count and x = StreetLight Zone Activity

Using the composite model, each increase of 1 in the index implies about 2.29 more travelers. Assuming accurate counts, the results show that the travelers at the Hyline Terminal are using LBS slightly more than those at the SSA Terminal. Nonetheless, the scales are very similar to each other.



This model (shown in Figure A2-A) is convenient to use when the actual number of people moving through a geofenced area of the island is unknown. It is designed specifically for use with a Visitor Home Work Analysis project. The analyst can run a project in StreetLight for any other geofenced zone on the island, while using the activity index to predict the number of people who move through that zone, on average, per day.

The significant drawback to this model is that it does not scale up significantly. That is, we cannot geofence the entire island and get a meaningful population estimate. However, this model can suit our needs for smaller areas where people come and go with regularity. For example, we have used these results to approximate how many people frequent one or another local beach. We intend to apply it for areas like Stop & Shop and the Whaling Museum. It is leveraged in Section B4 to approximate the average number of seasonal residents who stay on island each month. See that section for more details on geofencing parcels for LBS-driven population estimates.

Appendix - Population Groups

B1. Permanent Population

Permanent residents are people who make the island their primary home year-round. We estimate the permanent resident population by combining three components: (1) The Town Street List register maintained by the Town Clerk, (2) Persons identified by Civis Analytics as residents of Nantucket on the basis of voting, banking, and other records, and (3) an estimated number of children living with the adults in groups (1) and (2).

The Town Clerk, in accordance with Massachusetts law, maintains a list of residents of the Town. Updates to this list are requested annually through the official Town Census; updates may be made whenever a person reports (and documents) being a permanent resident at a street address. The Town Clerk provided NDP with an edited "public" version of this list current as of September 2017. It included all nonconfidential adults in the register at that time, which totaled 10,798.

NDP contracted with Civis Analytics to obtain and match with the Street List data on persons that Civis identifies as residents of Nantucket County. Civis compiles data from financial institutions, voting records, and other sources to create profiles on US residents. In collaboration with Civis, NDP was able to identify 3,392 additional adults not on the Street List as of September 2017 whom we believe should be classified as permanent Nantucket residents.

Combining these two sources appears to furnish a more complete list of the adult residents by including persons who had not yet self-identified as residents to the Town Clerk. Neither source, however, identifies children. Civis does not maintain records on children, and the Street List records provided to NDP exclude children to protect their privacy. Therefore, we must estimate the number of children living with the adults whom we identify as permanent residents.

To estimate the child population, we grouped adults into residential units based on their common street address. Each set of adults sharing a street address defined a household. Next, we assigned an estimated number of children to each such household, based on the ratio of children to adults shown in the US Census Bureau's American Community Survey. We used the Public Use Microdata Sample (ACS PUMS) for Massachusetts. ACS PUMS is a 1% representative sample of data well-suited to this specific task: estimating the presence of children based on the age and gender of adults residing at the same address. We judged the statewide sample data as likely to be a more reliable reflection of Nantucket's population, based on comparisons documented in Table B1-A.

PUMS data are available for a smaller sub-area ("PUMA") which encompasses Nantucket County, Dukes County and a portion of Barnstable County on Cape Cod. The Barnstable County portion, which accounts for most of this PUMA population, differs markedly from Nantucket. Residents are older and racially less diverse. While the national and MA percent over 65 is around 15%, Barnstable has 28% of the population over 65. Nantucket also proportionately has more Black and Latino people than the rest of the local PUMA, with the greatest ethnic discrepancy in the Latino population.

Table B1-A provides key comparisons for national-, state-, and county-level data on age and race. The adults in each household were grouped into the following age categories: 18-24, 25-29,30-34,35-39,40-44,45-49,50-54,55-59,60-64,65-69,70-74, and 75+. Additionally, households were grouped according to the number of adults in each household. Households with three or more adults were handled differently than those with one or two adults. For households with one or two adults, we estimated the number of children to be the mean number of children in households in the PUMS that match the gender and binned age of the adults in the household. For example, a Nantucket household with a 36-year-old male and a 33-year-old female was estimated to have the average number of children shown for PUMS households with a 35-39 year-old male and a 30-34 year-old female (and no other adults). The total number of children residing in the household was used regardless of the relationship between the child(ren) and adult(s) present.

TABLE BI-A. ACS 2016 Select Demographics of Nantucket Compared to Regional, State, and National Averages

	Under 18	Over 65	White	Black	Latino
United States	23%	15%	76%	14%	17%
Massachusetts	21%	15%	82%	9%	11%
Nantucket Co	20%	14%	89%	8%	12%
Barnstable Co	16%	28%	94%	3%	3%
Dukes Co	18%	20%	92%	8%	8%

For larger-size households, there are both more possible combinations of adults and smaller samples for estimating the average number of children in each. This limits the range of combinations we can estimate. For those instances, we used a linear regression model of number of children present, based on the number of adults and the number of adults of each gender-age group combination. We fit the model based on all of the three-plus-adult households in the Massachusetts PUMS sample, applied the model to each of our three-plus-adult Nantucket households and used the predicted value as the estimated number of children for that household.

When the age or gender of one or more household adults is unknown, the number of children in the household is estimated as 0.26 times the number of adults. This figure is based on overall reported number of children per adult in Nantucket overall. Using this logic, if we were not sure, we used the average according to the aggregated ACS data.

Table B1-B shows the number of households and the estimated number of children in each of these groups for households from the Street List and households from Civis' added records. Individuals identified by Civis are more likely to be single adult households than are individuals from Street List (35% vs 25%) and are less likely to be in male-female households (11% vs 19%) or three-plus-adult households (4% vs 16%).

Finally, Table B1-C shows the total number of estimated permanent residents by record source and age. Our methods yield an estimated total of 14,190 adults and 2,972 children for a grand total of 17,163 permanent residents, which we round to an official estimate of 17,160.

TABLE B1-B. Number of Children and Households of Each Type by Source of Adult Records

Household Type		Civis	Street List	Total
Single	Children	141	528	669
	Households	1,202	2,659	3,861
Man and Woman	Children	75	695	771
	Households	182	1,172	1,354
Two Men	Children	5	24	29
	Households	100	334	434
Two Women	Children	10	67	77
	Households	66	380	446
3+ Adults	Children	34	1,261	1,296
	Households	64	1,132	1,534
Unknown	Children	0	131	131
	Households	0	95	95
Total	**Children**	**265**	**2,707**	**2,889**
	Households	**1,614**	**6,110**	**7,724**

TABLE BI-C. Summary of Permanent Resident Population by Source

	Adults	Children	Total
Street List	10,798	2,707	13,505
Civis	3,392	265	3,657
Total	**14,190**	**2,972**	**17,163**

[1] US Census Bureau (2017). Public Use Microdata Sample (PUMS) Documentation. Retrieved from https://www.census.gov/programs-surveys/acs/technical-documentation/pums.html

B2. Year Round Commuters

Year-round commuters reside off the island and work at a regular job on Nantucket during the work week. Some come and go daily while others have access to local housing (typically paid by employers) and stay overnight, commuting weekly to and from their off-island home.

We estimated the number of year-round commuters using the fast ferry passenger records for the months of February and March of 2017. We chose this time period for several reasons: (1) Only one fast ferry operates during these months; (2) Visitor traffic is at a minimum; and (3) year-round commuting workers have resumed work routines after the holidays. We have omitted the raw passenger data from this document due to a non-disclosure agreement. However, we can present our findings based on that data.

Interviews with experienced commuters informed us that during this time 90% of passengers on the 6 am boat and 50% of the passengers on the 9 am boat are commuting workers, for a daily average of 265 commuter trips to Nantucket per day.

Some commuters ride the ferry daily. Others arrive on Monday and depart on Thursday, working four 10-hour days. To estimate weekly commuters, we calculated "excess" arrivals on Monday (compared with the midweek average). We observed that 149 extra passengers arrive on Monday compared to midweek, and we estimate 100 of them are weekly commuting workers who stay on the island through Thursday. Finally, we looked at the "deficit" of arrivals on Friday to estimate the daily commuters who work four 10-hour days. We see that midweek counts are higher than Friday by 60 at 6 am and by 31 at 9 am. From this, we estimate that 69 are traveling four times per week rather than five, leaving 196 total commuters present for the five-day work week.

TABLE B2-A. Total Ferry Trips per Week Attributable to Commuting Workers

Trips per Week	Number of Commuters	Total Trips
2	100	200
8	69	552
10	196	1,960
TOTAL	**365**	**2,712**

Each worker must make a return trip for each arrival, so the total number of trips made by commuters can be calculated as twice the arrivals. Table B2-A shows that a total of 2,712 ferry trips per week are attributable to 365 commuting workers.

An additional small number of commuting workers commute to Nantucket via a brief air taxi flight from Hyannis or New Bedford. We currently lack adequate data for estimating their numbers, but we know they are small relative to ferry arrivals. Three nine-passenger flights per weekday (a plausible upper limit on average weekday air taxi passenger arrivals) would account for just 10% of the 365 daily commuters arriving by ferry. As we acquire more data from airline carriers, we plan to survey both commuters and airport personnel to better estimate the volume of regular worker commuting via air taxis.

B3. Seasonal Workers

A seasonal worker is someone residing on Nantucket for a period of time (typically several months), filling one or several seasonal jobs created by tourism and the presence of many wealthy seasonal residents. Seasonal workers are especially difficult to count or estimate for several reasons. First, although they are not permanent Nantucket residents, the StreetLight data report Nantucket as their "home" within a month (based upon where their mobile devices reside most days and nights of the prior month during their seasonal presence). Second, on first arriving on Nantucket, seasonal workers mimic visitors on our metrics: their mobile device previously resided off-island. Third, on departing months thereafter, these same seasonal workers pass as Nantucket residents leaving home on our metrics: their mobile devices (having registered Nantucket as where they "live") register their departure. Finally, many seasonal workers who originate from abroad leave

little or no detectable economic footprint for Civis Analytics to discover – no bank account, credit card, or other transactional data indicating that "home" is a Caribbean island or an Eastern European country. Some unknown number may operate on a cash basis, relying upon a trusted family member for noncash transactions. All these considerations together make it likely that seasonal workers overlap with and confound our estimates of visitors and other effective population segments.

To determine the number of seasonal workers, we started by calculating demand. The first step was to quantify the local labor force available to help fill these positions. The local labor force is defined here as the number of permanent residents between the ages of 18 and 65. We found 9,754 adults on our permanent resident list that qualified.

The next question we sought to answer was the number of potential jobs that had to be filled each month. The federal Bureau of Labor and Statistics (BLS) and the Bureau of Economic Analysis (BEA) track the number of jobs across the nation. BLS tabulates the data it collects by state unemployment insurance programs, so the universe measured by these data covered by unemployment insurance. BEA uses this tabulation as a starting point for its figures. Several industries and nonprofits do not participate in unemployment insurance programs. The BEA captures those, as well as college student jobs, interns, and various forms of independent contracting. Although the BEA data encompass a broader universe of jobs, BEA report those data annually whereas BLS does so monthly.

TABLE B3-A. Projected BEA Monthly Estimates According to BLS Data

Time Period	Preliminary BLS Employees	Index	Projected BEA Employees	Projected BEA Proprietors	Monthly Total Job Estimate
January	5,118	0.69	5,458	3,212	8,670
February	5,081	0.69	5,419	3,189	8,608
March	5,251	0.71	5,600	3,295	8,896
April	6,132	0.83	6,540	3,848	10,388
May	7,364	1.00	7,854	4,621	12,475
June	9,393	1.27	10,018	5,895	15,913
July	10,551	1.43	11,253	6,622	17,874
August	10,558	1.43	11,260	6,626	17,886
September	8,795	1.19	9,380	5,520	14,899
October	7,593	1.03	8,098	4,765	12,863
November	6,467	0.88	6,897	4,059	10,956
December	6,116	0.83	6,523	3,838	10,361
Avg Annual	**7,368**	**1.00**	**7,858**	**4,624**	**12,482**

To explore these two alternative data sources, we first analyzed the distribution of jobs reported monthly by the BLS for Nantucket (using the current "preliminary 2017" numbers). The index value presented in Table B3-A shows how the BLS monthly employment varies from the average for each observation. The BEA has not yet reported 2017 numbers. To project a BEA number, we calculated the average annual BEA growth shown for Nantucket for the most recent three years, then applied that growth to 2016 in order to project a 2017 annual average. Finally, we applied the BLS monthly to the BEA figures to estimate the monthly BEA distribution of jobs for Nantucket.

Next, we compared the monthly total jobs to the number of adults in the local labor force, taking into account unemployment. During winter 2017, the number of persons in the labor force exceed the number of jobs. During the 2017 July-August peak season, this imbalance sharply reversed, with almost 8,000 more jobs than workers to fill them (and concurrently, a very low measured rate of unemployment). The equations below show how the number of seasonal jobs was estimated using all the employment information at hand:

Total Work Force=Local Labor Force+Commuters-Unemployment
Seasonal Jobs=Monthly Total Job Estimate-Total Work Force

[2] Bureau of Economic Analysis (2018). Frequently Asked Questions. Retrieved from https://www.bea.gov/faq/index.cfm?faq_id=104

It is well known that many Nantucket residents hold more than one job year-round to afford the high local cost of living. This pattern becomes more commonplace during the summer, as housing costs spike and employment opportunities materialize. A 2013 study conducted in Jackson Hole, WY, found that the average worker in the Tetons worked 1.2 jobs. We have applied that scale in Table B3-B to complete our seasonal worker estimate.

TABLE B3-B. Estimated Number of 2017 Seasonal Workers by Month

Time Period	Monthly Total Job Estimate	Local Labor Force	Un-employed	Commuters	Total Work Force	Seasonal Jobs	Seasonal Worker Estimate at 1.2 Jobs Each
January	8,670	9,754	630	365	9,489	-	-
February	8,608	9,754	608	365	9,511	-	-
March	8,896	9,754	514	365	9,605	-	-
April	10,388	9,754	287	365	9,832	556	463
May	12,475	9,754	213	365	9,906	2,569	2,141
June	15,913	9,754	195	365	9,924	5,989	4,990
July	17,874	9,754	166	365	9,953	7,921	6,601
August	17,886	9,754	144	365	9,975	7,911	6,593
September	14,899	9,754	152	365	9,967	4,932	4,110
October	12,863	9,754	150	365	9,969	2,894	2,412
November	10,956	9,754	213	365	9,906	1,050	875
December	10,361	9,754	301	365	9,818	543	453

For now, we are unsure whether the average Nantucket seasonal worker holds 1.2 jobs (we have only unsubstantiated "guesstimates" as alternatives). To strengthen and refine these estimates, we plan to conduct interviews on this population in the coming months much as we did with the regular commuters. We realize that without hearing the individual stories of the regular commuters to Nantucket, we would never have been able to estimate the number of commuters to the island. Big data is a strong asset, but without understanding people's actual behavioral patterns, whole groups can still go undetected. In the case of the regular commuters, we learned their behavior patterns and then were able to consult the data to find the numbers. Similarly, we plan to conduct structured interviews with a cross-section of seasonal workers to understand the stories of their coming and going. With established patterns in place, we can look back at the hyper local tools in our arsenal to see what additional information we find on this group.

B4. Seasonal Residents

A seasonal resident is a homeowner who resides on Nantucket for only part of the year. For the purposes of this study, the seasonal resident behaves like a resident while on the island. This means that they come for an extended stay as opposed to frequent weekend visits. She lives in her second home while present on the island but may rent to visitors during other parts of the year.

[3] Silbernagel, Kara (2013). The Effective Population of Teton County, Wyo. Jackson, WY: Jackson Hole Conservation Alliance.

We first singled out all the residential parcels with a dwelling listed in the appraisal roll. We then looked at the mailing address reported by the appraiser. There were 5,149 residential parcels that had their tax bill mailed to an off-island address. We anticipated that some of these owners use a proxy with an off-island address to handle their financial affairs. To remove false positives (i.e., actual local homeowners whose tax bills suggest they are seasonal residents), we compared this parcel list to the information given by Civis Analytics. According to Civis, 593 of these owners had behavior that qualified as a permanent resident. This correction reduced our list from 5,149 above to 4,556 parcels.

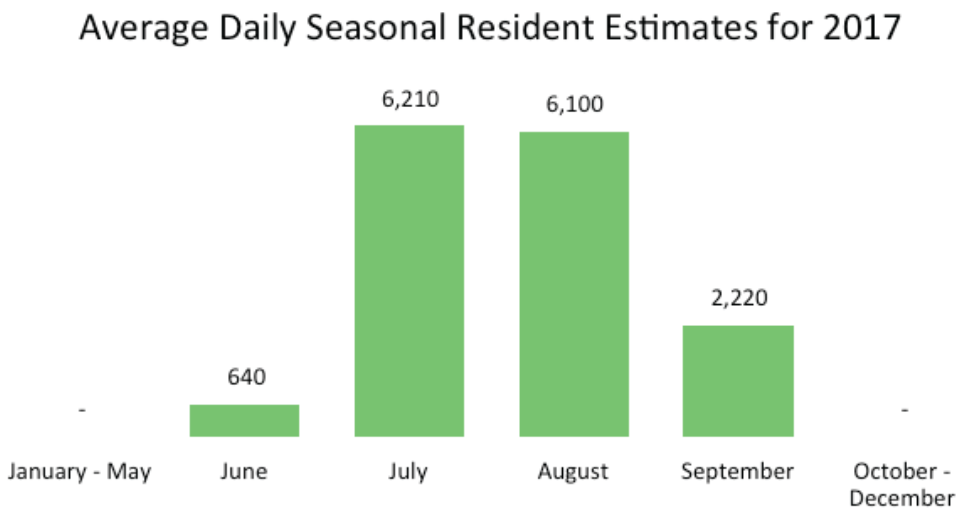
After removing duplicate owner names, we identified a total of 4,254 second home owners, including 602 residential parcels registered to business names, typically through limited liability companies. We geocoded the mailing addresses to determine the origins of this group. Each unique owner was attributed a household size based on the average household size of their block group of origin. The overall average household size was 2.4. This average was attributed to all addressees with a non-US mailing address. Based on these figures, we estimate that if every seasonal resident were on the island at once, they would number just short of 11,000 people. It is possible this is still an overestimate. In the near future we will compare the business owners on this list to the list provided by Civis Analytics to hone these numbers even further.

We combined all the second home owner parcels and ran them through the StreetLight Visitor Home Work Analysis. We know that StreetLight zone activity will cumulatively count throughout the day (see Section A2). Therefore, we hoped to apply precise geography and a precise time window to isolate the activity we wanted. Analyzing the entire day would double-count people who come in and out of their homes multiple times. To avoid this issue, we chose to run the analysis on an overnight window from 10pm to 7am.

The initial zone activity result showed all overnight activity on the parcels. However, we wanted to isolate owners from visitors as much as possible, knowing that homeowners rent their residences to visitors. StreetLight infers that Nantucket is "home" only for persons who are present on Nantucket overnight more frequently than any other place. Therefore, we can model only seasonal residents who stay on the island for an extended time. In this way, we captured second homeowners who behave like residents during their seasonal stays.

We used the composite model described in Section A2 to estimate the number of such seasonal residents. This first set of results showed over 1,000 seasonal residents in and around Town all year round. In contrast, it showed the expected distribution of seasonal residents in the less dense areas on the outskirts of Town and toward the beaches. In those locations, we saw no residents in winter, and most people on island in July and August. We know from experience that there are very few seasonal residents in winter. It was anomalous to see so many, and only in Town. We surmised from these results that the LBS data leveraged by StreetLight had too low geographic precision to geofence small parcels close to each other. The 1,000+ residents in winter were permanent residents living next door, incorrectly captured as SHOs.

To circumvent the imprecision of LBS data, we chose to use medium density parcels to determine the peaks and dips in SHO occupancy. While the densely populated Town was suspected to pick up extra people, the low-density neighborhoods had gaps in their results from insufficient data. The following Civic Leagues were chosen for the baseline because they were less dense than Town, but consistently returned sufficient results in StreetLight: Harbor South, Monomoy, Shimmo, Siasconset, Surfside, and Tom Nevers.



Since these parcels comprised about one-third of the total number, we multiplied the results proportionately to predict the entire island's seasonal resident population by month. Figure B4-A shows how the data appeared across the year. The highest number we estimated was about 6,210 average daily population in the month of July.

This data assumes that the residency patterns across the island are uniform. It is also prone to sampling error, with so few SHOs present in winter. We know StreetLight can only detect seasonal residents after they have stayed on the island longer than a visitor. Similarly, they would fall from detection two to three weeks before leaving. With more questions to answer, NDP is currently investigating ways to improve these results through surveys and focus groups. We are also investigating the use of post office forwarding data to detect when these seasonal owners start and end stays.

B5. Visitors

Visitors account for most of the variation in Nantucket's effective population throughout the year. Whether one considers the average population count during a given week in August or the total number of different faces who were present during that week, it is visitors coming and going who outnumber most everyone else. We define a visitor as anyone who is briefly present on the island, for part of a day or for a weekend, or any continuous stay up to 10 days. This definition aligns with StreetLight data, which designates a visitor as anyone who spends most nights of that calendar month somewhere other than Nantucket.

In order to quantify "visitors," we first had to define each of the other population segments of Nantucket's effective population that contribute to its variation. When entering through a ferry or airline terminal, everyone except a permanent resident or year-round commuter from off island looks at first like a visitor. That is, Streetlight data identifies them as people arriving on Nantucket who reside and work someplace else. Their mobile device cannot register any preexisting intent to stay longer than 10 days. In short, anyone with an off-island home passing through one of our transportation turnstiles is a visitor unless designated otherwise. Since we have an almost complete picture of trips to and from Nantucket, we are moderately confident in this measure of visitors.

The largest source of error for visitors traces to the fact that airport trip data, of necessity, are largely modeled. We must assume that flights come and go in the same rhythm as do ferries (reflecting demand for transportation). Having only monthly enplanement and deplanement data from the airport, we must estimate the daily ebb and flow. By our estimate the airport accounts for less than 15% of Nantucket's daily population turnover, so modest estimation errors are tolerable.

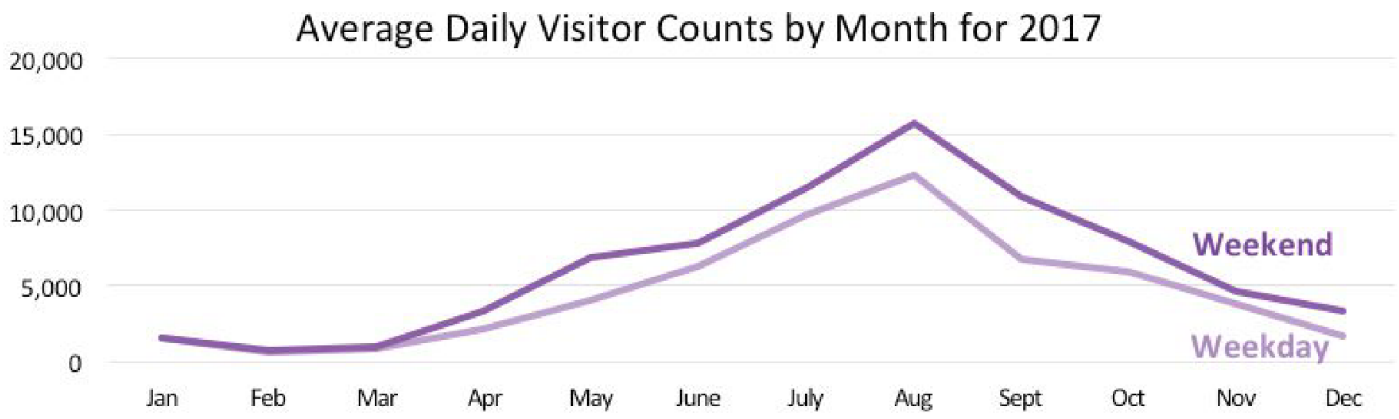


Figure B5-A shows how the number of visitors averages about 15,500 on an average August weekend and 12,200 on the weekdays. This is a smoothed average of the entire month. In February we detect the fewest visitors at less than 500 per day.

StreetLight gives us home locations for people who come from the lower 48 states. From that data, we can see that Nantucket visitors come from all the states in the continental United States. In winter greater than 80% of people who pass through the transportation terminals are from Massachusetts. In summer, the percent from Massachusetts is closer to 60%. In May we begin seeing larger contingents from New England, but also Pennsylvania, Florida, and California. We estimate that about 87,000 visits to Nantucket are from people who live in the Boston area, and about 42,000 from New York City. Table B5-B shows the top 20 places from where Nantucket visitors originated between Memorial Day and Labor Day 2017.

These numbers all denote visits and not individual people. For example, 10 visits could be one person coming and going 10 times, or 10 people coming and going from the island once each. Our tools do not allow us to track or identify individuals, but only trends in the ebb and flow.

Nonetheless those trends tell us that the effective population of Nantucket is rich and diverse. We have only begun to understand this procession of people coming and going from the ports of this one small island. We look forward to strengthening and deepening our understanding of each of these five population groups in the future.

TABLE B5-B. Top 20 Origin Metro Areas of Nantucket Summer Visits

Metropolitan Area	Visits
Boston-Cambridge-Quincy, MA-NH	87,100
New York-Northern New Jersey-Long Island, NY-NJ-PA	42,200
Barnstable Town, MA	25,700
Providence-New Bedford-Fall River, RI-MA	21,900
Bridgeport-Stamford-Norwalk, CT	19,000
Washington-Arlington-Alexandria, DC-VA-MD-WV	10,200
Hartford-West Hartford-East Hartford, CT	9,000
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	8,200
Worcester, MA	6,600
Miami-Fort Lauderdale-Pompano Beach, FL	5,800
NewHaven-Milford, CT	3,900
Chicago-Joliet-Naperville, IL-IN-WI	3,700
Springfield, MA	3,600
Los Angeles-Long Beach-Santa Ana, CA	3,500
San Francisco-Oakland-Fremont, CA	3,100
Atlanta-Sandy Springs-Marietta, GA	2,800
Baltimore-Towson, MD	2,700
Portland-South Portland-Biddeford, ME	2,700
Manchester-Nashua, NH	2,600
Dallas-Fort Worth-Arlington, TX	2,300

Appendix - All Five Groups

Table C-A. Average Daily Weekday Population 2017

	Daytime Population	Permanent Resident	Commuters	Seasonal Residents	Seasonal Workers	Visitors
January	19,000	17,160	365	-	-	1,475
February	18,010	17,160	365	-	-	485
March	18,220	17,160	365	-	-	695
April	20,020	17,160	365	-	463	2,032
May	23,640	17,160	365	-	2,141	3,974
June	29,320	17,160	365	640	4,990	6,165
July	39,950	17,160	365	6,210	6,601	9,614
August	42,430	17,160	365	6,100	6,593	12,212
September	30,570	17,160	365	2,220	4,110	6,715
October	25,760	17,160	365	-	2,412	5,823
November	22,090	17,160	365	-	875	3,690
December	19,590	17,160	365	-	453	1,612

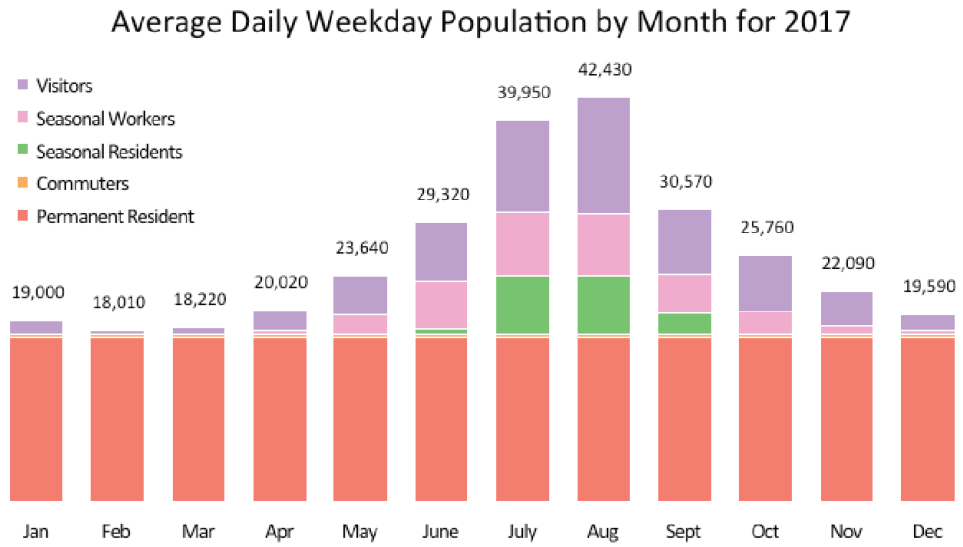
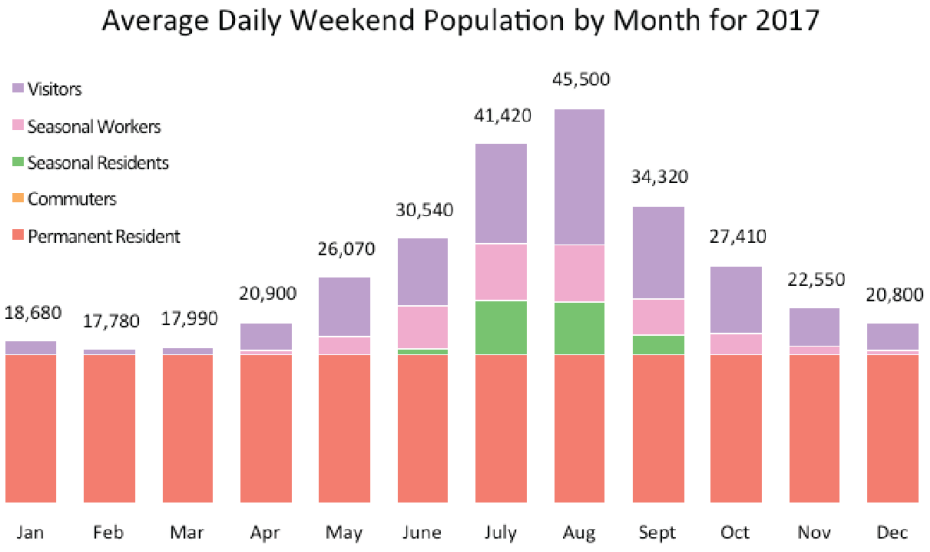


Table C-B. Average Daily Weekend Population 2017

	Daytime Population	Permanent Resident	Commuters	Seasonal Residents	Seasonal Workers	Visitors
January	18,680	17,160	-	-	-	1,520
February	17,780	17,160	-	-	-	620
March	17,990	17,160	-	-	-	830
April	20,900	17,160	-	-	463	3,277
May	26,070	17,160	-	-	2,141	6,769
June	30,540	17,160	-	640	4,990	7,750
July	41,420	17,160	-	6,210	6,601	11,449
August	45,500	17,160	-	6,100	6,593	15,647
September	34,320	17,160	-	2,220	4,110	10,830
October	27,410	17,160	-	-	2,412	7,838
November	22,550	17,160	-	-	875	4,515
December	20,800	17,160	-	-	453	3,187



The Nantucket Data Platform

WHO WE ARE AND WHAT WE DO

The Nantucket Data Platform is an energetic collaboration between data scientists, demographers, data visualizers, and writers, supported by local leaders from businesses, nonprofit groups, and government. The NDP team is using wide-ranging sources and innovative techniques to build what *N Magazine* calls "the clearest statistical model of the island ever created." NDP's long-term goal is to assemble actionable information and place it in the hands of local decision-makers and citizens, so they can replace guesswork with evidence-based decisions.

HOW WE THINK ABOUT DATA AND PRIVACY

We take seriously our responsibility to handle data in a safe, responsible, and ethical manner. Not only do we adhere to all Massachusetts and federal regulations, but we also abide by industry standards, utilize best practices, and keep the Advisory Board regularly updated on our work in this area.

We are members of the Insights Association, an organization dedicated to supporting and evolving the research and data analytics industry. We committed to adhere to their extensive code of conduct ensuring that we are acting responsibly and developing high-quality data, tools, and solutions.

Finally, we operate under a Data Usage Framework which we developed by reviewing best data industry practices and working with our Advisory Board and legal team.

DATA USAGE FRAMEWORK

What we believe about data:

- Information lies at the core of economic and cultural progress.
- The use of objective data supports collaboration among a wide range of citizens, elected and appointed officials, business folks, nonprofit executives, researchers and technologists.
- Results are derived through data analytics are not a substitute for judgment, but rather a means to help improve decision-making.
- Data management and analytics should not be viewed as the purview of the "few", but rather a resource that is broadly available.
- The value of data increases based on its access, diversity, quality, and applicability across a wide range of applications, both in the private and public sectors.
- The use of data and analytics should lead to positive action, not endless debate.

THE FOLLOWING PRINCIPLES ARE INTEGRAL TO OUR TREATMENT OF DATA IN EVERYTHING WE DO:

Purpose Data collection and use should be purposeful, intentional, and connected to our core objective: to make communities smarter and stronger. We will not collect data for the sake of having data.

Community Engagement We will continually invite input and learn from the community on how they view data as a resource.

Privacy The privacy of individuals remains critically important to us. We will maintain controls designed to protect any personal information we store, whether collected by us directly or obtained through our third-party partners.

Transparency Whenever possible and without compromising privacy or confidentiality agreements, we will endeavor to make available to the public methodologies and the data insights we develop.

Partnerships We expect to collect significant data from publicly available sources. Additionally, we will only contract for additional data from third-party private sources who make commitments to us with respect to the integrity of the data presented to us and its method of collection.

FSC

To provide input on our approach to privacy or our data framework, email us at **privacy@nantucketdataplatform.com**