Housing Affordability Data System

Team 4**:**

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1. Introduction:

In this project we have analyzed a data set provided by https://www.data.gov/ which is the official U.S. government site providing public access to federal government datasets.

Specifically, we have worked with the Housing Affordability Data System ([HADS](https://www.huduser.gov/portal/datasets/hads/hads.html)), which is a set of files derived from the 1985 and later national American Housing Survey (AHS) and the 2002 and later Metro AHS. This system categorizes housing units by affordability and households by income, with respect to the Adjusted Median Income, Fair Market Rent (FMR), and poverty income. It also includes housing cost burden for owner and renter households.

We have carefully examined the data set for 2013; we have found each row contains information pertaining to the following variables:

CONTROL,AGE1,METRO3,REGION,LMED,FMR,L30,L50,L80,IPOV,BEDRMS,BUILT,STATUS,TYPE,VALUE, VACANCY, TENURE,NUNITS,ROOMS,WEIGHT,PER,ZINC2,ZADEQ,ZSMHC, STUCTURETYPE,OWNRENT,UTILITY, FMTASSISTED, FMTBURDEN,FMTREGION,FMTSTATUS

1. Implementation:
   1. Database Connection: We have analyzed the 2013 HADS data and ran on Hadoop on a cluster of 2 or 3 virtual machines to computer the relevant correlation between occupant data, location and income. Initially, we have set up the virtual machine environment an embedded the apache Hadoop framework in it. We then wrote java code and implemented all the necessary calculations in it to get the relevant correlations. By using the Hadoop on the virtualization machines, we were able to extract the necessary results from the HADS text files. This has been done through the assistance of Hadoop. The Hadoop played a role as the bridge between the Java program we wrote and the HADS text files that were given. We also created graphs through Excel to exhibit the relevant correlations between the Occupant data with Location, Location with Income or Occupant data with Income.
   2. Virtualization Machines:

In computing, a virtual machine (VM) is an emulation of a computer system. Virtual machines are based on computer architectures and provide functionality of a physical computer. Their implementations may involve specialized hardware, software, or a combination.

There are different kinds of virtual machines, each with different functions:

* System virtual machines (also termed full virtualization VMs) provide a substitute for a real machine. They provide functionality needed to execute entire operating systems. A hypervisor uses native execution to share and manage hardware, allowing for multiple environments which are isolated from one another, yet exist on the same physical machine. Modern hypervisors use hardware-assisted virtualization, virtualization-specific hardware, primarily from the host CPUs.
* Process virtual machines are designed to execute computer programs in a platform-independent environment.

In our project, we have used virtual machines such as Happy and Grumpy to implement the Hadoop and to analyze the 2013 HADS data in order to compute the relevant correlations between the Occupant data, location and income which contains the age of the head of the house hold, number of persons in the household, owner/renter status, City and Suburban, Region and the Household income.

* 1. Apache Hadoop:

The Apache Hadoop software library is a framework that allows for the distributed processing of large data sets across clusters of computers using simple programming models. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage. Rather than rely on hardware to deliver high-availability, the library itself is designed to detect and handle failures at the application layer, so delivering a highly-available service on top of a cluster of computers, each of which may be prone to failures.

Hadoop is supported by GNU/Linux platform and its flavors. Therefore, we have to install a Linux operating system for setting up Hadoop environment. In case you have an OS other than Linux, you can install Virtual box software in it and have Linux inside the Virtual box.

The core of Apache Hadoop consists of a storage part, known as Hadoop Distributed File System (HDFS), and a processing part which is a [MapReduce](https://en.wikipedia.org/wiki/MapReduce) [programming model](https://en.wikipedia.org/wiki/Programming_model). Hadoop splits files into large blocks and distributes them across nodes in a cluster. It then transfers [packaged code](https://en.wikipedia.org/wiki/JAR_(file_format)) into nodes to process the data in parallel. This approach takes advantage of [data locality](https://en.wikipedia.org/wiki/Data_locality),[[3]](https://en.wikipedia.org/wiki/Apache_Hadoop#cite_note-3) where nodes manipulate the data they have access to. This allows the dataset to be [processed](https://en.wikipedia.org/wiki/Distributed_processing) faster and more efficiently than it would be in a more conventional [supercomputer architecture](https://en.wikipedia.org/wiki/Supercomputer_architecture) that relies on a [parallel file system](https://en.wikipedia.org/wiki/Parallel_file_system) where computation and data are distributed via high-speed networking.

In our project, we have embedded the Apache Hadoop Software in our virtual machines to get the distributed processing of large data sets across clusters of computers using simple programming models. The MapReduce we implemented in our Java class has allowed us to get the crucial information we were looking for. Through the Hadoop, we executed the MapReduce function in our program to gather all the results we were looking for.

* 1. HADS documentation file:

The Housing Affordability Data System (HADS) is a set of housing-unit level datasets that measures the affordability of housing units and the housing cost burdens of households, relative to area median incomes, poverty level incomes, and Fair Market Rents. The purpose of these datasets is to provide housing analysts with consistent measures of affordability and burdens over a long period. The datasets are based on the American Housing Survey (AHS) national files from 1985 through 2009 and the metropolitan files from 2002 through 2009. Users can link records in HADS files to AHS records, allowing access to all of the AHS variables. Introduction The HADS grew out of a project to provide similar tabulations to the Millennial Housing Commission (MHC) for the years 1985, 1995, and 1999.1 This document is a summary of how we constructed the HADS. It is a description of data selection, affordability calculation, and tabulation categories. The document is aimed at housing analysts who are familiar with current issues and techniques of measuring housing affordability. Technical points concerning computer programming are relegated to footnotes. Those who are proficient in reading SAS code are encouraged to consult the program listings that accompany the datasets. The strength and value of the HADS is that it incorporates more than twenty years of housing data using assumptions and computations consistent with the practice of the housing analysts that contributed to the MHC. This allows policy deliberations to focus on real policy choices, without the distraction of debating the meaning of the underlying data. Note that HADS development continued after the commission published its report. Thus, tabulations using the HADS datasets will not be exactly the same as those published by the MHC.

1. Results:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Region | 2003 | 2005 | 2007 | 2011 | 2013 |
| Region1 | 56162.197 | 53399.957 | 57999.721 | 57421.406 | 65074.616 |
| Region2 | 52230.261 | 47022.519 | 51117.858 | 51417.33 | 54753.498 |
| Region3 | 48700.498 | 46855.988 | 52672.317 | 54248.8475 | 53845.769 |
| Region4 | 55465.259 | 54832.595 | 60785.341 | 61839.304 | 62463.449 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| City&Sub | 2003 | 2005 | 2007 | 2011 | 2013 |
| City&Sub1 | 55222.9713 | 52278.27 | 57726.0088 | 55737.0475 | 59820.0138 |
| City&Sub2 | 63607.5175 | 60248.9875 | 66290.27 | 65437.87 | 69509.3375 |
| City&Sub3 | 60107.5488 | 58138.3325 | 63929.2213 | 64241.375 | 69644.0488 |
| City&Sub4 | 43078.5913 | 39730.305 | 44261.0575 | 44991.7138 | 47018.8075 |
| City&Sub5 | 43681.14 | 42242.9288 | 46012.4888 | 47110.4925 | 49179.4575 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Row Labels | 2003 | 2005 | 2007 | 2011 | 2013 |
| City&Sub1 | 2.49 | 2.45 | 2.43 | 2.40 | 2.42 |
| City&Sub2 | 2.53 | 2.51 | 2.50 | 2.49 | 2.51 |
| City&Sub3 | 2.63 | 2.61 | 2.55 | 2.60 | 2.62 |
| City&Sub4 | 2.28 | 2.31 | 2.29 | 2.27 | 2.27 |
| City&Sub5 | 2.44 | 2.43 | 2.44 | 2.41 | 2.40 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Row Labels | 2003 | 2005 | 2007 | 2011 | 2013 |
| OwnerAge | 51.34 | 51.22 | 50.80 | 52.88 | 53.78 |
| RenterAge | 35.96 | 36.32 | 36.77 | 38.53 | 40.22 |
| OwnerHousePerson | 2.61 | 2.59 | 2.57 | 2.53 | 2.53 |
| RenterHousePerson | 2.33 | 2.33 | 2.31 | 2.33 | 2.36 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Region | CityAndSub | OwnOrRent | IncomeOfHouseHold | AgeOfHouseHold | NumberOfPeople | Year |
| 1 | 1 | 1 | 82082.34 | 53.35 | 2.57 | 2013 |
| 1 | 1 | 2 | 42536.84 | 43.63 | 2.22 | 2013 |
| 1 | 2 | 1 | 105594.98 | 54.07 | 2.71 | 2013 |
| 1 | 2 | 2 | 45000.26 | 44.92 | 2.16 | 2013 |
| 1 | 3 | 1 | 99448.22 | 55.31 | 2.63 | 2013 |
| 1 | 3 | 2 | 62083.95 | 39.86 | 2.38 | 2013 |
| 1 | 4 | 1 | 78224.33 | 54.04 | 2.22 | 2013 |
| 1 | 4 | 2 | 24640.39 | 50.46 | 1.84 | 2013 |
| 1 | 5 | 1 | 73856.94 | 55.47 | 2.48 | 2013 |
| 1 | 5 | 2 | 37277.91 | 46 | 2.24 | 2013 |
| 2 | 1 | 1 | 73174.1 | 50.99 | 2.58 | 2013 |
| 2 | 1 | 2 | 29292.52 | 38.21 | 2.2 | 2013 |
| 2 | 2 | 1 | 89148.89 | 53.22 | 2.61 | 2013 |
| 2 | 2 | 2 | 40548.5 | 41.34 | 2.14 | 2013 |
| 2 | 3 | 1 | 85455.18 | 53.13 | 2.66 | 2013 |
| 2 | 3 | 2 | 42854.9 | 38.7 | 2.45 | 2013 |
| 2 | 4 | 1 | 63251.21 | 53.14 | 2.38 | 2013 |
| 2 | 4 | 2 | 27931.29 | 39.51 | 1.96 | 2013 |
| 2 | 5 | 1 | 63197.46 | 55.13 | 2.44 | 2013 |
| 2 | 5 | 2 | 32680.93 | 39.35 | 2.29 | 2013 |
| 3 | 1 | 1 | 77525.54 | 52.31 | 2.44 | 2013 |
| 3 | 1 | 2 | 32038.24 | 36.19 | 2.19 | 2013 |
| 3 | 2 | 1 | 88876.38 | 52.37 | 2.62 | 2013 |
| 3 | 2 | 2 | 40459.18 | 38.37 | 2.36 | 2013 |
| 3 | 3 | 1 | 76697.58 | 54.12 | 2.59 | 2013 |
| 3 | 3 | 2 | 44861.97 | 35.55 | 2.58 | 2013 |
| 3 | 4 | 1 | 64529.44 | 53.27 | 2.4 | 2013 |
| 3 | 4 | 2 | 25747.73 | 34.69 | 2.4 | 2013 |
| 3 | 5 | 1 | 56751.16 | 54.93 | 2.37 | 2013 |
| 3 | 5 | 2 | 30970.47 | 38.5 | 2.51 | 2013 |
| 4 | 1 | 1 | 98619.95 | 52.64 | 2.67 | 2013 |
| 4 | 1 | 2 | 43290.58 | 40.92 | 2.5 | 2013 |
| 4 | 2 | 1 | 99005.36 | 53.77 | 2.8 | 2013 |
| 4 | 2 | 2 | 47441.15 | 41.92 | 2.71 | 2013 |
| 4 | 3 | 1 | 95789.83 | 53.96 | 2.74 | 2013 |
| 4 | 3 | 2 | 49960.76 | 37.45 | 2.92 | 2013 |
| 4 | 4 | 1 | 57406.57 | 54.1 | 2.39 | 2013 |
| 4 | 4 | 2 | 34419.5 | 39.5 | 2.57 | 2013 |
| 4 | 5 | 1 | 62971.26 | 56.22 | 2.29 | 2013 |
| 4 | 5 | 2 | 35729.53 | 39.4 | 2.57 | 2013 |
| 1 | 1 | 1 | 69927.54 | 51.11 | 2.69 | 2003 |
| 1 | 1 | 2 | 43573.94 | 39.86 | 2.26 | 2003 |
| 1 | 2 | 1 | 98604.75 | 52.48 | 2.77 | 2003 |
| 1 | 2 | 2 | 42002.11 | 41.07 | 2.17 | 2003 |
| 1 | 3 | 1 | 86181.53 | 50.73 | 2.77 | 2003 |
| 1 | 3 | 2 | 38644.88 | 39.34 | 2.36 | 2003 |
| 1 | 4 | 1 | 64592.34 | 53.71 | 2.43 | 2003 |
| 1 | 4 | 2 | 26681.82 | 40.87 | 1.88 | 2003 |
| 1 | 5 | 1 | 60489.79 | 52.35 | 2.52 | 2003 |
| 1 | 5 | 2 | 30923.27 | 39.03 | 2.3 | 2003 |
| 2 | 1 | 1 | 68692.77 | 49.56 | 2.6 | 2003 |
| 2 | 1 | 2 | 31617.86 | 32.49 | 2.26 | 2003 |
| 2 | 2 | 1 | 80446.89 | 49.99 | 2.68 | 2003 |
| 2 | 2 | 2 | 36789.69 | 36.79 | 2.05 | 2003 |
| 2 | 3 | 1 | 85672.9 | 49.31 | 2.8 | 2003 |
| 2 | 3 | 2 | 36188.78 | 36.8 | 2.21 | 2003 |
| 2 | 4 | 1 | 67036.5 | 53.07 | 2.4 | 2003 |
| 2 | 4 | 2 | 28019.2 | 33.73 | 2.01 | 2003 |
| 2 | 5 | 1 | 60969.99 | 51.83 | 2.55 | 2003 |
| 2 | 5 | 2 | 26868.03 | 37.51 | 2.22 | 2003 |
| 3 | 1 | 1 | 72950.09 | 50.64 | 2.5 | 2003 |
| 3 | 1 | 2 | 31470.16 | 30.54 | 2.21 | 2003 |
| 3 | 2 | 1 | 76699.17 | 49.56 | 2.65 | 2003 |
| 3 | 2 | 2 | 39145.76 | 32.19 | 2.36 | 2003 |
| 3 | 3 | 1 | 74746.08 | 49.94 | 2.67 | 2003 |
| 3 | 3 | 2 | 35242.81 | 32.78 | 2.41 | 2003 |
| 3 | 4 | 1 | 54319.75 | 53.01 | 2.34 | 2003 |
| 3 | 4 | 2 | 23154.66 | 31.46 | 2.32 | 2003 |
| 3 | 5 | 1 | 49605.05 | 52.88 | 2.44 | 2003 |
| 3 | 5 | 2 | 29671.45 | 36.55 | 2.51 | 2003 |
| 4 | 1 | 1 | 83701.36 | 50.36 | 2.78 | 2003 |
| 4 | 1 | 2 | 39850.05 | 35.41 | 2.58 | 2003 |
| 4 | 2 | 1 | 93231.98 | 50.28 | 2.92 | 2003 |
| 4 | 2 | 2 | 41939.79 | 36.98 | 2.63 | 2003 |
| 4 | 3 | 1 | 78081.13 | 51.28 | 2.79 | 2003 |
| 4 | 3 | 2 | 46102.28 | 35.09 | 2.99 | 2003 |
| 4 | 4 | 1 | 53734.63 | 52.29 | 2.4 | 2003 |
| 4 | 4 | 2 | 27089.83 | 33.94 | 2.47 | 2003 |
| 4 | 5 | 1 | 59769.44 | 52.5 | 2.5 | 2003 |
| 4 | 5 | 2 | 31152.1 | 36.82 | 2.49 | 2003 |
| 1 | 1 | 1 | 73049.86 | 53.07 | 2.46 | 2011 |
| 1 | 1 | 2 | 34805.82 | 41.12 | 2.21 | 2011 |
| 1 | 2 | 1 | 86889.78 | 54.33 | 2.62 | 2011 |
| 1 | 2 | 2 | 39337.81 | 44.16 | 2.07 | 2011 |
| 1 | 3 | 1 | 92795.29 | 54.42 | 2.66 | 2011 |
| 1 | 3 | 2 | 48622.55 | 38.42 | 2.4 | 2011 |
| 1 | 4 | 1 | 75092.36 | 53.75 | 2.2 | 2011 |
| 1 | 4 | 2 | 22116.29 | 44.29 | 1.75 | 2011 |
| 1 | 5 | 1 | 69286.91 | 55 | 2.46 | 2011 |
| 1 | 5 | 2 | 32217.39 | 45.51 | 2.3 | 2011 |
| 2 | 1 | 1 | 66579.15 | 50.42 | 2.48 | 2011 |
| 2 | 1 | 2 | 26190.87 | 34.83 | 2.17 | 2011 |
| 2 | 2 | 1 | 84500.67 | 52.37 | 2.62 | 2011 |
| 2 | 2 | 2 | 37607.99 | 39.07 | 2.15 | 2011 |
| 2 | 3 | 1 | 79005.77 | 52.82 | 2.7 | 2011 |
| 2 | 3 | 2 | 39441.11 | 38.71 | 2.48 | 2011 |
| 2 | 4 | 1 | 62624.51 | 53.92 | 2.43 | 2011 |
| 2 | 4 | 2 | 25498.22 | 39.85 | 2.02 | 2011 |
| 2 | 5 | 1 | 62825.13 | 53.71 | 2.49 | 2011 |
| 2 | 5 | 2 | 29899.88 | 41.09 | 2.33 | 2011 |
| 3 | 1 | 1 | 72050.67 | 51.5 | 2.47 | 2011 |
| 3 | 1 | 2 | 32002.82 | 33.96 | 2.26 | 2011 |
| 3 | 2 | 1 | 82223.32 | 51.19 | 2.66 | 2011 |
| 3 | 2 | 2 | 38005.78 | 36.13 | 2.4 | 2011 |
| 3 | 3 | 1 | 76178.46 | 52.75 | 2.55 | 2011 |
| 3 | 3 | 2 | 44299.89 | 35.18 | 2.53 | 2011 |
| 3 | 4 | 1 | 59876.79 | 52.36 | 2.42 | 2011 |
| 3 | 4 | 2 | 23851.82 | 35.82 | 2.38 | 2011 |
| 3 | 5 | 1 | 55536.13 | 54.61 | 2.41 | 2011 |
| 3 | 5 | 2 | 29341.91 | 36.76 | 2.6 | 2011 |
| 3 | 9 | 1 | 94177.88 | 48.1 | 2.54 | 2011 |
| 3 | 9 | 2 | 43440.7 | 32.39 | 2.24 | 2011 |
| 4 | 1 | 1 | 95660.65 | 51.84 | 2.66 | 2011 |
| 4 | 1 | 2 | 45556.54 | 37.44 | 2.48 | 2011 |
| 4 | 2 | 1 | 102546.04 | 52.68 | 2.74 | 2011 |
| 4 | 2 | 2 | 52391.57 | 38.36 | 2.65 | 2011 |
| 4 | 3 | 1 | 91091.62 | 51.93 | 2.69 | 2011 |
| 4 | 3 | 2 | 42496.31 | 38.61 | 2.76 | 2011 |
| 4 | 4 | 1 | 60975.05 | 54.11 | 2.5 | 2011 |
| 4 | 4 | 2 | 29898.67 | 38.96 | 2.46 | 2011 |
| 4 | 5 | 1 | 62712.14 | 55.7 | 2.34 | 2011 |
| 4 | 5 | 2 | 35064.45 | 38.41 | 2.38 | 2011 |
| 1 | 1 | 1 | 74947.05 | 51.14 | 2.59 | 2007 |
| 1 | 1 | 2 | 40469.67 | 40.24 | 2.25 | 2007 |
| 1 | 2 | 1 | 98684.6 | 52.19 | 2.73 | 2007 |
| 1 | 2 | 2 | 41630.61 | 41.37 | 2.03 | 2007 |
| 1 | 3 | 1 | 94429.22 | 52.13 | 2.7 | 2007 |
| 1 | 3 | 2 | 48886.16 | 34.09 | 2.4 | 2007 |
| 1 | 4 | 1 | 62998.69 | 52 | 2.32 | 2007 |
| 1 | 4 | 2 | 25356.52 | 43.53 | 2.03 | 2007 |
| 1 | 5 | 1 | 59362.06 | 52.44 | 2.43 | 2007 |
| 1 | 5 | 2 | 33232.63 | 43.11 | 2.3 | 2007 |
| 2 | 1 | 1 | 69305.75 | 48.42 | 2.59 | 2007 |
| 2 | 1 | 2 | 29012.91 | 32.95 | 2.18 | 2007 |
| 2 | 2 | 1 | 82945.85 | 50.13 | 2.64 | 2007 |
| 2 | 2 | 2 | 36893.57 | 38.41 | 2.1 | 2007 |
| 2 | 3 | 1 | 79895.66 | 49.59 | 2.75 | 2007 |
| 2 | 3 | 2 | 35808.91 | 37.18 | 2.18 | 2007 |
| 2 | 4 | 1 | 61850.85 | 51.36 | 2.37 | 2007 |
| 2 | 4 | 2 | 27019.43 | 34.92 | 1.96 | 2007 |
| 2 | 5 | 1 | 58800.54 | 52.31 | 2.51 | 2007 |
| 2 | 5 | 2 | 29645.11 | 36.44 | 2.28 | 2007 |
| 3 | 1 | 1 | 75020.53 | 48.85 | 2.48 | 2007 |
| 3 | 1 | 2 | 34422.03 | 31.38 | 2.19 | 2007 |
| 3 | 2 | 1 | 84509.21 | 48.04 | 2.64 | 2007 |
| 3 | 2 | 2 | 41722.04 | 33.21 | 2.44 | 2007 |
| 3 | 3 | 1 | 78446.67 | 49.89 | 2.66 | 2007 |
| 3 | 3 | 2 | 41010.06 | 31.5 | 2.4 | 2007 |
| 3 | 4 | 1 | 61494.46 | 51.19 | 2.37 | 2007 |
| 3 | 4 | 2 | 25366.32 | 33.55 | 2.29 | 2007 |
| 3 | 5 | 1 | 56187.06 | 53.61 | 2.45 | 2007 |
| 3 | 5 | 2 | 28544.79 | 36.95 | 2.61 | 2007 |
| 4 | 1 | 1 | 96289.28 | 48.5 | 2.73 | 2007 |
| 4 | 1 | 2 | 42340.85 | 35.58 | 2.42 | 2007 |
| 4 | 2 | 1 | 96028.68 | 49.43 | 2.85 | 2007 |
| 4 | 2 | 2 | 47907.6 | 37.42 | 2.59 | 2007 |
| 4 | 3 | 1 | 88966.04 | 51.59 | 2.74 | 2007 |
| 4 | 3 | 2 | 43991.05 | 39.69 | 2.54 | 2007 |
| 4 | 4 | 1 | 60126.21 | 49.93 | 2.47 | 2007 |
| 4 | 4 | 2 | 29875.98 | 35.5 | 2.48 | 2007 |
| 4 | 5 | 1 | 65035.18 | 53.3 | 2.38 | 2007 |
| 4 | 5 | 2 | 37292.54 | 38.37 | 2.59 | 2007 |
| 1 | 1 | 1 | 67880.96 | 50.75 | 2.62 | 2005 |
| 1 | 1 | 2 | 38212.92 | 39.86 | 2.27 | 2005 |
| 1 | 2 | 1 | 89449.39 | 52.43 | 2.76 | 2005 |
| 1 | 2 | 2 | 40772.35 | 41.77 | 2.14 | 2005 |
| 1 | 3 | 1 | 83989.16 | 51.33 | 2.73 | 2005 |
| 1 | 3 | 2 | 41811.82 | 37.49 | 2.48 | 2005 |
| 1 | 4 | 1 | 57456.71 | 53.39 | 2.39 | 2005 |
| 1 | 4 | 2 | 23919.67 | 41.97 | 2.1 | 2005 |
| 1 | 5 | 1 | 61710.81 | 52.47 | 2.5 | 2005 |
| 1 | 5 | 2 | 28795.78 | 40.32 | 2.2 | 2005 |
| 2 | 1 | 1 | 61507.96 | 48.8 | 2.58 | 2005 |
| 2 | 1 | 2 | 27892.15 | 31.92 | 2.19 | 2005 |
| 2 | 2 | 1 | 76887.36 | 49.87 | 2.63 | 2005 |
| 2 | 2 | 2 | 34024.89 | 36.32 | 2.05 | 2005 |
| 2 | 3 | 1 | 73886.92 | 49.2 | 2.78 | 2005 |
| 2 | 3 | 2 | 33557.53 | 34.44 | 2.3 | 2005 |
| 2 | 4 | 1 | 56409.17 | 51.34 | 2.37 | 2005 |
| 2 | 4 | 2 | 25824.76 | 34.5 | 2.04 | 2005 |
| 2 | 5 | 1 | 53706.65 | 52.21 | 2.51 | 2005 |
| 2 | 5 | 2 | 26527.8 | 36.14 | 2.17 | 2005 |
| 3 | 1 | 1 | 66868.74 | 50.37 | 2.49 | 2005 |
| 3 | 1 | 2 | 31134.6 | 32.5 | 2.18 | 2005 |
| 3 | 2 | 1 | 74158.14 | 49.21 | 2.66 | 2005 |
| 3 | 2 | 2 | 36578.79 | 34.96 | 2.38 | 2005 |
| 3 | 3 | 1 | 69076.7 | 50.74 | 2.67 | 2005 |
| 3 | 3 | 2 | 36743.88 | 32.93 | 2.41 | 2005 |
| 3 | 4 | 1 | 51442.39 | 51.58 | 2.36 | 2005 |
| 3 | 4 | 2 | 25394.75 | 31.65 | 2.3 | 2005 |
| 3 | 5 | 1 | 48757.8 | 52.64 | 2.47 | 2005 |
| 3 | 5 | 2 | 28404.09 | 37.31 | 2.43 | 2005 |
| 4 | 1 | 1 | 84765.9 | 49.33 | 2.76 | 2005 |
| 4 | 1 | 2 | 39962.93 | 35.42 | 2.53 | 2005 |
| 4 | 2 | 1 | 86005.56 | 50.19 | 2.88 | 2005 |
| 4 | 2 | 2 | 44115.42 | 36.69 | 2.59 | 2005 |
| 4 | 3 | 1 | 79427.98 | 51.27 | 2.79 | 2005 |
| 4 | 3 | 2 | 46612.67 | 37.94 | 2.68 | 2005 |
| 4 | 4 | 1 | 51599.16 | 53.07 | 2.43 | 2005 |
| 4 | 4 | 2 | 25795.83 | 33.98 | 2.47 | 2005 |
| 4 | 5 | 1 | 59762.51 | 54.21 | 2.51 | 2005 |
| 4 | 5 | 2 | 30277.99 | 38.37 | 2.61 | 2005 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Region2013 | Income2013 | Age2013 | Per2013 | Region2003 | Income2003 | Age2003 | Per2003 |
| 1 | 73333.82 | 49.77 | 2.44 | 1 | 69907.61 | 47.53 | 2.55 |
| 2 | 62640.42 | 47.89 | 2.42 | 2 | 62867.97 | 45.49 | 2.51 |
| 3 | 59717.2 | 46.61 | 2.43 | 3 | 57908.7 | 44.56 | 2.48 |
| 4 | 69794.42 | 47.79 | 2.64 | 4 | 66695.17 | 44.69 | 2.72 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CitySub2013 | Income2013 | Age2013 | Per2013 | Region2003 | Income2003 | Age2003 | Per2003 |
| 1 | 55057.86 | 44.98 | 2.38 | 1 | 56159.01 | 42.23 | 2.5 |
| 2 | 77179.16 | 49.11 | 2.55 | 2 | 73112.08 | 45.98 | 2.63 |
| 3 | 79373.71 | 50.7 | 2.62 | 3 | 73992.07 | 47.63 | 2.69 |
| 4 | 47281.38 | 46.35 | 2.32 | 4 | 47397.98 | 45.05 | 2.32 |
| 5 | 55358.26 | 51.67 | 2.4 | 5 | 50955.12 | 49.43 | 2.48 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| OwnerRenter2013 | Income2013 | Age2013 | Per2013 | Region2003 | Income2003 | Age2003 | Per2003 |
| 1 | 84574.08 | 53.5 | 2.59 | 1 | 76329.39 | 50.87 | 2.66 |
| 2 | 38859.3 | 40.3 | 2.31 | 2 | 36713.7 | 35.35 | 2.34 |
|  |  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Region2013 | Income | Age | Per |
| 1 | 73333.82 | 49.77 | 2.44 |
| 2 | 62640.42 | 47.89 | 2.42 |
| 3 | 59717.2 | 46.61 | 2.43 |
| 4 | 69794.42 | 47.79 | 2.64 |

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| CitySub2013 | Income | Age | Per |
| 1 | 55057.86 | 44.98 | 2.38 |
| 2 | 77179.16 | 49.11 | 2.55 |
| 3 | 79373.71 | 50.7 | 2.62 |
| 4 | 47281.38 | 46.35 | 2.32 |
| 5 | 55358.26 | 51.67 | 2.4 |

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| OwnerRenter2013 | Income | Age | Per |
| 1 | 84574.08 | 53.5 | 2.59 |
| 2 | 38859.3 | 40.3 | 2.31 |

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| Region2003 | Income | Age | Per |
| 1 | 69907.61 | 47.53 | 2.55 |
| 2 | 62867.97 | 45.49 | 2.51 |
| 3 | 57908.7 | 44.56 | 2.48 |
| 4 | 66695.17 | 44.69 | 2.72 |
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|  |  |  |  |
| CitySub2003 | Income | Age | Per |
| 1 | 56159.01 | 42.23 | 2.5 |
| 2 | 73112.08 | 45.98 | 2.63 |
| 3 | 73992.07 | 47.63 | 2.69 |
| 4 | 47397.98 | 45.05 | 2.32 |
| 5 | 50955.12 | 49.43 | 2.48 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| OwnerRenter2003 | Income | Age | Per |
| 1 | 76329.39 | 50.87 | 2.66 |
| 2 | 36713.7 | 35.35 | 2.34 |