# INVESTIGATION OF THE CANCER INCIDENCE RATES IN THE VICINITY OF O'HARE AIRPORT

R. E. RUTHENBERG, B.S.E.E.  3/13/02
Principal Staff Engineer (ret.), Motorola, Inc.

Illinois cancer incidence statistics from the Illinois State Cancer Registry were examined for all zip code areas within a 10 mile radius of O'Hare airport, to attempt to determine whether there appear to be any zip code based "hot spots" with significantly higher than average area incidence rates, that might be related to O'Hare emissions. Source data can be obtained at:
http://www.idph.state.il.us/about/epi/cancer.htm

Zip code area identification resulted in 69 areas, after deleting zero-population areas (e.g. major corporate sites). Year 2000 population for each area was obtained and combined with the sorted cancer incidence statistics to create the final comparison figures.

All figures in this report summarize the 5-year period 1994-1998. The state overall rates for this period were: LCI=1.981%, Mean: 1.998%, UCI: 2.015%. That is, a mean 1.998% of the state population experienced cancer incidence during this period, with a 95% confidence level range of 1.981-2.015%. ["LCI/UCI"=Lower/Upper Confidence Interval, here for 95% probability.]

A word on statistical methods is in order here. A "Normal Distribution" is often experienced in nature or in statistics involving large quantities that are randomly distributed around some mean level. The data set for the entire state is large enough (some 280,000 incidences) that a normally distributed result would be expected. However, a normal distribution cannot be assumed for the results of this analysis because (a) the number of zip code areas (69) is small and (b) the actual variation across the zip code set is presumed to have a high probability of a decidedly non-random variation.

Thus, median levels are used here instead (half of the points greater than and half less than) and "standard deviations" and confidence intervals based on a "normal" distribution assumption are not established.

The median cancer incidence rate for the 69 zip codes within 10 miles of O'Hare is determined to be 2.57% for the 5-year period [see Appendix for specific data]. This is about 29% greater than the 2% Illinois state average and as such would already be considered high. Further, since these large population areas make up a part of the state average, it would be expected that areas outside of the Chicagoland urban pollution influence might be experiencing substantially lower rates than that average (perhaps around 1.5%).

Though this (high) median incidence level and its relativity to the state average is of interest, the primary objective here is to look for geographical variation patterns within the 10 mile radius area and to determine if there appears to be any O'Hare proximity correlation.

The first examination is characterized in figure 1, which plots the overall incidence rate (again, the reader is reminded that this is a 5 year rate) for each of the 69 zip code areas, generally comprising a 1-4% range. The Harwood Heights 60706 zip code area shows an extreme incidence of 7.43%, well beyond the range of the other areas and, after rechecking source data, the reason for this anomaly remains unknown. Figure 1 generally demonstrates a middle range of incidence rate data points between 2-3%, a low range of <2% and a high range of >3%.

Another broad scale data examination for potential O'Hare correlation is shown in figure 2, where cancer incidence rates are plotted versus the zip code area's distance from the airport. No clear correlation appears. This might be expected, as distance by itself is not the only key variable to pollutant travel; direction relative to prevailing winds as well as pollutant distribution in and near the airport confines will affect results. Thus two areas of equal distance but on opposite sides of the airport could experience significantly different pollution levels with correspondingly different pollution-caused cancer rates. Any such trends are hidden in figure 2 by the congestion of all the data points.

The figure 3 area map brings direction as well as distance into the data examination. Zip code based incidence rates (rounded to one decimal place) were classified into the three previous categories i.e. Middle=2-3% (median=2.57%), Low=<2% and High=>3%. Though somewhat arbitrary, it is felt that reasonable people would consider a range of 33% - 50% (4%/3% range upper limits and 3%/4% lower limits) increase in incidence rates versus the middle range to be very "high" relative to that rangeand rates less than the state average of 2% to be "low". *[As compared to the 2% state average level, the "High" rates would be considered "Very High" (50-100% greater).]*

The 12 High incidence rate areas are plotted on the map, as these are the areas of interest. The 9 Low and 47 Middle range areas are not plotted, as they can generally be visualized as "everything else".

The mapped results clearly show a preponderance of cancer incidence "hotspots" to the northeast of the airport. This airport correlation may not be surprising considering that the prevailing winds here, especially in the summer when people are outdoors more, tend to blow toward the northeast. Also, inversion layers occurring over the lake or breezes off the lake (land/water temperature difference) may tend to create "walls" that traps pollutants in the area between the airport and the lakefront.

There also are some hotspot areas directly south of the airport and these would tend to correlate with the relatively heavy flight traffic to the south. A good way to see where the average airport traffic flows are is to look at the figure 4 noise contour map, as the contours tend to follow the flight pattern intensity. Further, the contours inherently factor in aircraft altitudes, as higher aircraft create less noise and considering that ground level pollution is the primary concern, higher altitude aircraft will result in longer "drift" distances before their emission by-products reach the ground (with correspondingly greater dispersion). It would be expected that the greatest emission concentrations would be at or near "ground zero" i.e. the airport confines and perhaps a few mile radius (departing aircraft will generate greater net emissions, including from ground idling/run-up, but will reach greater altitudes at a given distance than arriving aircraft).

## CONCLUSIONS

Mapping of the cancer incidence data for the 5-year period of 1994-1998 appears to show a clear tendency for the incidence rates to be significantly higher in and correlated to the O'Hare airport "downwind" areas to the northeast. Those living in the northeast areas are experiencing between 50-100% greater cancer incidence rates than the state average and 33-50% greater than the local area median.

There seems on the surface to be no other logical reason for this incidence concentration; automobile traffic distributions are fairly even throughout the general area and the "hotspot" areas are relatively dispersed such as to mitigate any extreme local conditions e.g. a nearby manufacturing facility.

Though not studied, age and life style distributions would seem to be fairly uniform throughout these similar neighborhoods.

The cancer incidence rates studied here are reported from the 1994-1998 period, which is about 6 years ago already. Cancer due to pollution exposure is generally not an instantaneous function. That is, there is some latency exposure period, with the time frame generally measured in years and latency an inverse function of the pollution concentration. Thus, the cancer incidences of 1994-1998 were a result of pollution exposure years or even decades prior to that time. It can be safely stated that the levels of airport pollution are much higher today than decades ago and if airport traffic continues to expand, will be substantially higher in the future.

Thus, the high cancer (hotspot) incidence rates summarized here are probably precursors of much worse times to come, if nothing changes, since children and the middle-aged are already exposed to increasingly higher pollution levels than years/decades ago (the elderly's fate is pretty much already determined).

The odds are not good, remembering that the incidence rates here are not cumulative i.e. they are for one 5-year “window”. Thus if the High rate is nominally 3.5% per 5 years, today’s 5 year old child can look forward to a cancer probability of 14% at age 25, 28% by age 45 and 42% upon retirement at age 65! But the situation is actually worse, because the pollution levels are already much higher than during the exposure period related to the 3.5% rate.

It seems clear that O’Hare airport pollution generation must be substantially reduced (50:1?) in the near future in order to avoid future medical crises.

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FIG 1

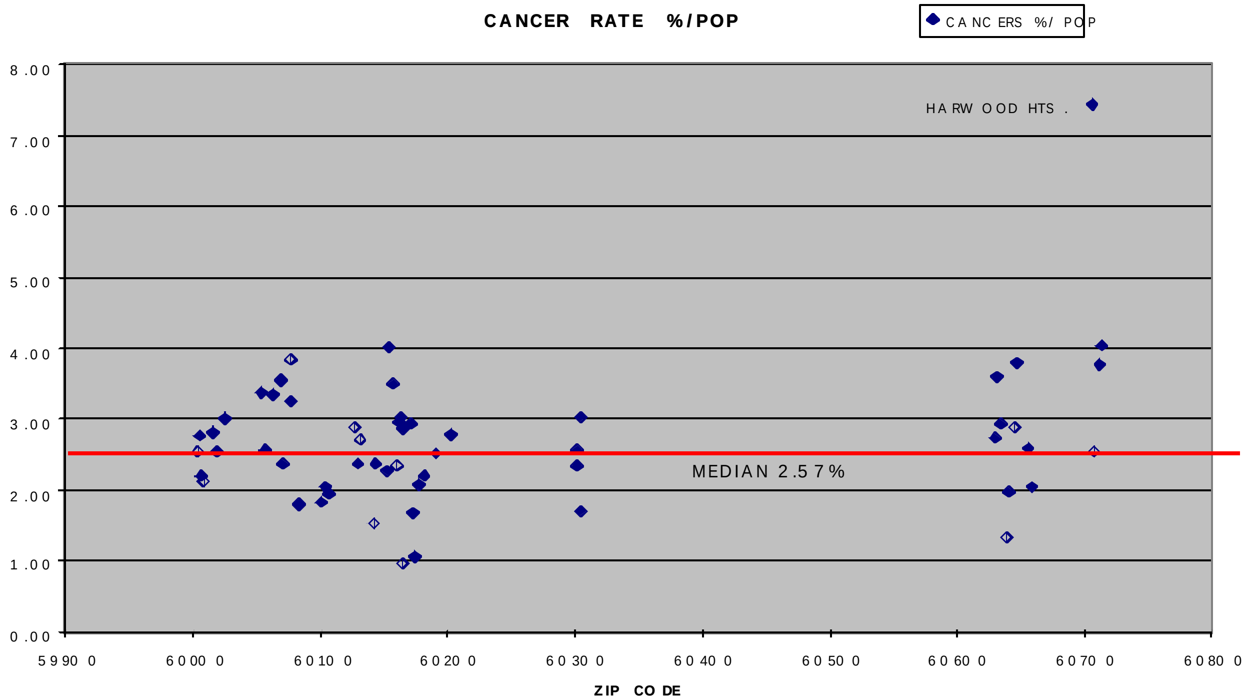
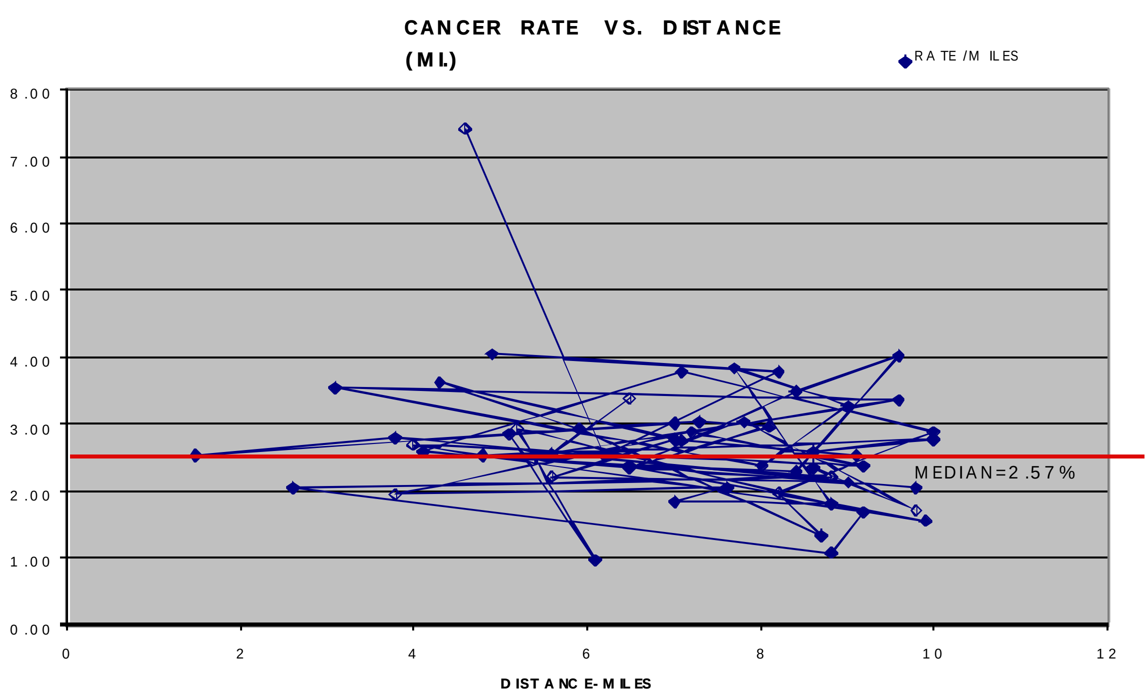



FIG. 2




Basemap coutesy of Mapquest, Inc.

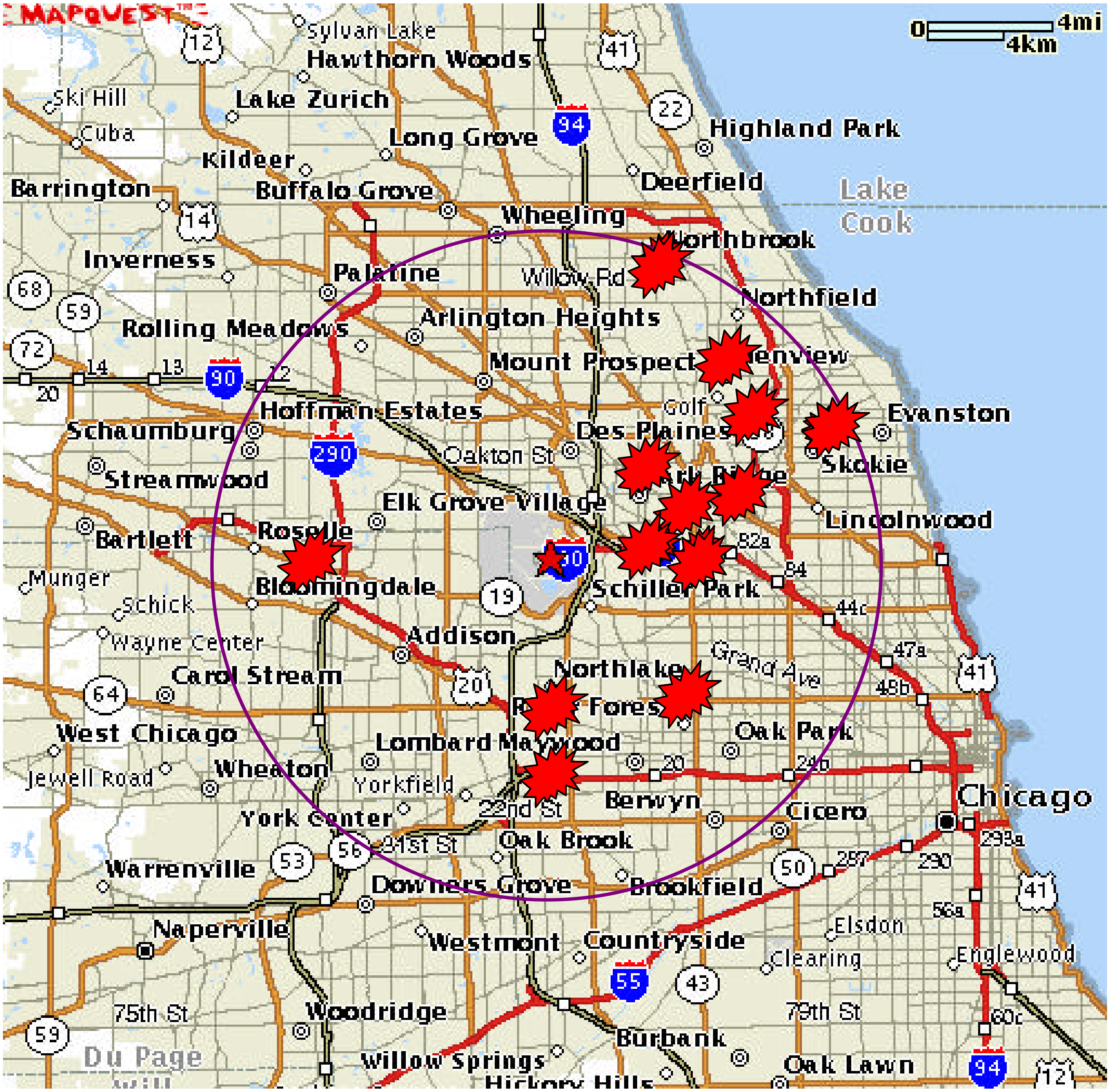
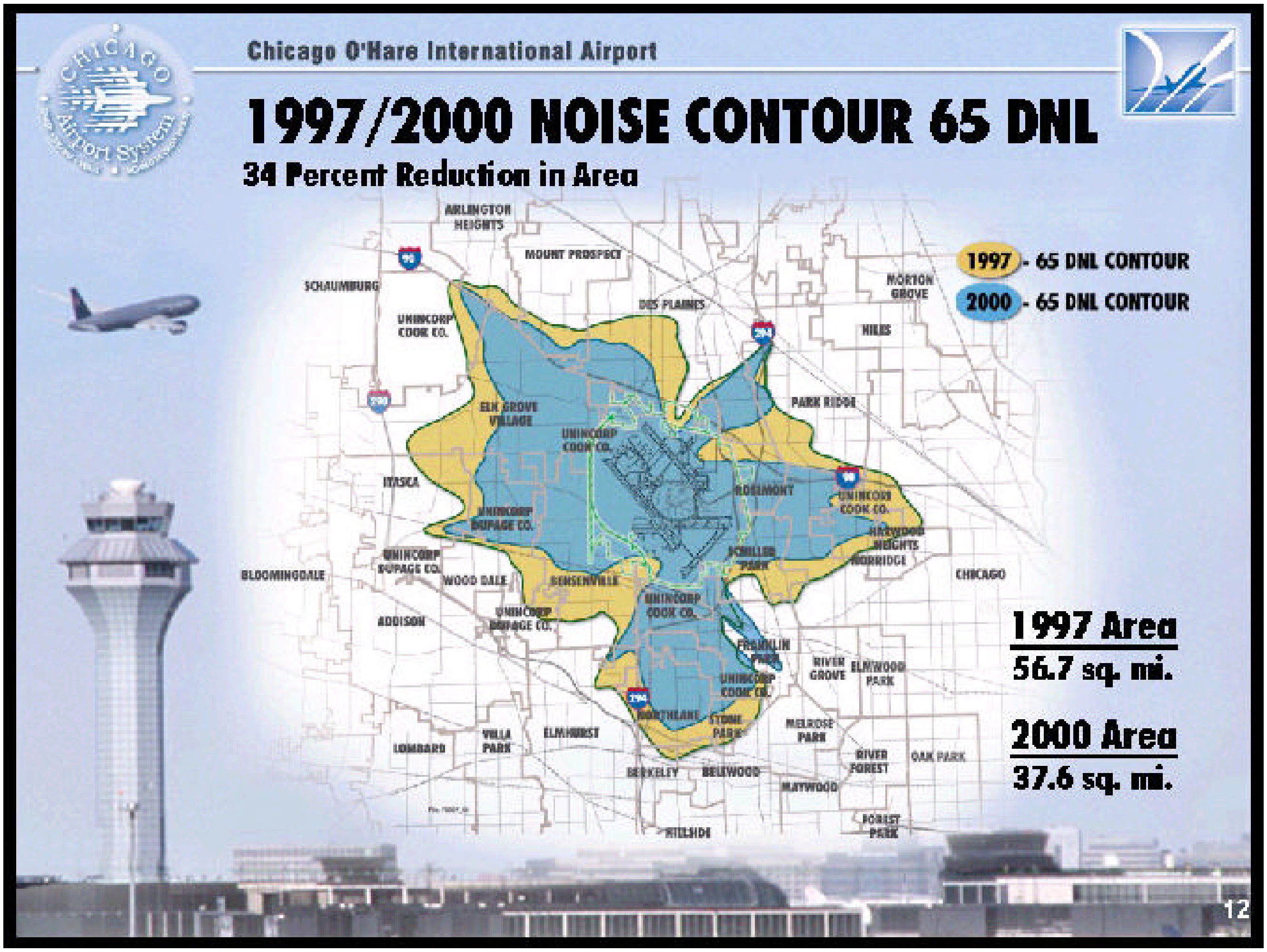


**FIG 3**

"High" cancer incidence zip code areas (rates of 3-4%) are marked as red "explosions". All other areas (rates <3%) within the 10-mile O'Hare radius circle are unmarked.

FIGURE 4




APPENDIX

Statistics Summary by Zip Code Area

| ZIP | CITY | MILES | POP | TOTAL # CANCERS | % TOTAL CANCERS/POP |
|---|---|---|---|---|---|
| 60004 | Arlington Heights | 9.1 | 52,962 | 1343 | 2.54 |
| 60005 | Arlington Heights | 7 | 31,504 | 872 | 2.77 |
| 60007 | Elk Grove Village | 5.6 | 36,390 | 800 | 2.20 |
| 60008 | Rolling Meadows | 9 | 22,859 | 486 | 2.13 |
| 60016 | Des Plaines | 3.8 | 59,046 | 1654 | 2.80 |
| 60018 | Des Plaines | 1.5 | 28,814 | 729 | 2.53 |
| 60025 | Glenview | 7 | 48,580 | 1453 | 2.99 |
| 60026 | Glenview Nas | 7.8 | 1,476 | 0 | [0] |
| 60029 | Golf | 7 | 70 | 12 | [17.14] |
| 60053 | Morton Grove | 6.5 | 23,032 | 779 | 3.38 |
| 60056 | Mount Prospect | 5.6 | 55,508 | 1420 | 2.56 |
| 60062 | Northbrook | 9.6 | 41,363 | 1383 | 3.34 |
| 60068 | Park Ridge | 3.1 | 37,274 | 1319 | 3.54 |

| | | | | | |
|---|---|---|---|---|---|
| 60070 | Prospect Heights | 8 | 16,156 | 383 | 2.37 |
| 60076 | Skokie | 9 | 33,874 | 1104 | 3.26 |
| 60077 | Skokie | 7.7 | 24,507 | 941 | 3.84 |
| 60082 | Techny | 8.8 | 1,385 | 25 | 1.81 |
| 60101 | Addison | 7 | 37,583 | 685 | 1.82 |
| 60104 | Bellwood | 7.6 | 20,492 | 421 | 2.05 |
| 60106 | Bensenville | 3.8 | 22,614 | 437 | 1.93 |
| 60126 | Elmhurst | 7.2 | 44,761 | 1289 | 2.88 |
| 60130 | Forest Park | 9.2 | 15,446 | 366 | 2.37 |
| 60131 | Franklin Park | 4 | 19,874 | 536 | 2.70 |
| 60141 | Hines | 9.9 | 976 | 15 | 1.54 |
| 60143 | Itasca | 6.5 | 10,248 | 243 | 2.37 |
| 60153 | Maywood | 8.4 | 27,415 | 624 | 2.28 |
| 60154 | Westchester | 9.6 | 16,656 | 670 | 4.02 |
| 60157 | Medinah | 8.4 | 2,321 | 81 | 3.49 |
| 60160 | Melrose Park | 6.5 | 22,823 | 536 | 2.35 |
| 60162 | Hillside | 8.1 | 7,971 | 236 | 2.96 |
| 60163 | Berkeley | 7.3 | 5,195 | 157 | 3.02 |
| 60164 | Melrose Park | 5.1 | 21,545 | 613 | 2.85 |
| 60165 | Stone Park | 6.1 | 4,927 | 47 | 0.95 |
| 60171 | River Grove | 5.2 | 10,896 | 320 | 2.94 |
| 60172 | Roselle | 9.2 | 25,849 | 433 | 1.68 |
| 60173 | Schaumburg | 8.8 | 11,479 | 122 | 1.06 |
| 60176 | Schiller Park | 2.6 | 11,701 | 241 | 2.06 |
| 60181 | Villa Park | 8.8 | 31,046 | 683 | 2.20 |
| 60191 | Wood Dale | 4.8 | 14,394 | 363 | 2.52 |
| 60203 | Evanston | 10 | 4,540 | 126 | 2.78 |
| 60301 | Oak Park | 8.6 | 1,944 | 50 | 2.57 |
| 60302 | Oak Park | 8.6 | 33,021 | 776 | 2.35 |
| 60304 | Oak Park | 9.8 | 17,541 | 300 | 1.71 |
| 60305 | River Forest | 7.8 | 11,665 | 353 | 3.03 |
| 60630 | Chicago | 7.1 | 53,732 | 1468 | 2.73 |
| 60631 | Chicago | 4.3 | 29,179 | 1051 | 3.60 |
| 60634 | Chicago | 5.9 | 74,513 | 2186 | 2.93 |
| 60639 | Chicago | 8.7 | 96,666 | 1282 | 1.33 |
| 60641 | Chicago | 8.2 | 74,270 | 1459 | 1.96 |
| 60645 | Chicago | 10 | 45,174 | 1301 | 2.88 |
| 60646 | Chicago | 7.1 | 27,019 | 1022 | 3.78 |
| 60656 | Chicago | 4.1 | 35,744 | 920 | 2.57 |
| 60659 | Chicago | 9.8 | 41,504 | 844 | 2.03 |
| 60666 | Amf Ohare | 0 | 1,739 | 0 | [0] |
| 60706 | Harwood Heights | 4.6 | 12,277 | 912 | 7.43 |
| 60707 | Elmwood Park | 6.2 | 44,733 | 1132 | 2.53 |
| 60712 | Lincolnwood | 8.2 | 12,321 | 465 | 3.77 |
| 60714 | Niles | 4.9 | 30,935 | 1252 | 4.05 |
| | TOTALS | | 1,549,529 | 40720 | |

MEDIAN= 2.57%