UNDER STRICT EMBARGO
UNTIL 2/15/2018

RESIDENTIAL PROPERTY ASSESSMENT IN COOK COUNTY

SUMMARY OF ANALYTICAL FINDINGS

Civic Consulting alliance

the engine of public-private collaboration

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ABSTRACT

At the request of the President of the Cook County Board of Commissioners and the Cook County Assessor, Civic Consulting Alliance and a nationally-recognized expert analyzed, on a pro bono basis, Cook County's residential real estate assessment processes and outcomes. The evaluation focused on four goals: uniformity, timeliness, compliance, and transparency. For uniformity, CCA has found that the residential assessment system is more variable and more regressive than agreed upon industry standards, causing a wealth transfer from owners of lower-value homes to those of higher-value homes. The assessment process has met the standard that the bills be completed on time for the past six years, and the system appears to be in compliance with the requirement that residential assessments are at 10% of market value. The system's alignment with industry standards of transparency has not been evaluated, yet. Bringing the system into compliance with industry standards will require fundamental changes in modeling, review processes, data collection, and a shift away from reliance on appeals. Cross-departmental workshops to design solutions and implementation plans in each of these categories have begun.

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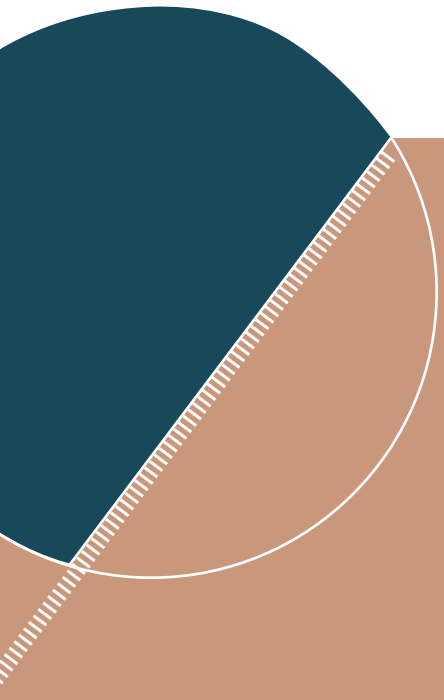


"...if properties are not assessed uniformly, some property owners pay more than their fair share of property taxes and some pay correspondingly less."

WHY ASSESSMENT MATTERS TO COOK COUNTY TAXPAYERS

Every year each taxing body in Cook County determines how much cash it will require from property taxes to fund its budget. The required cash is the tax levy. For example, within Chicago, the total tax levy in 2016 was $5.9 billion, which was the sum of the property tax levies from 12 different taxing bodies:

- Municipal taxing bodies, including the City of Chicago, the Chicago Library Fund, and the Chicago School Building and Improvement Fund
- Educational taxing bodies, including the Chicago Public Schools and the City Colleges of Chicago.
- County taxing bodies, including Cook County, Cook County Public Safety, Cook County Health Facilities, Cook County Forest Preserve
- Miscellaneous taxing bodies, including the Water Reclamation District, Parks-Museum/Aquarium Bond, and Chicago Park District

This $5.9 billion levy is paid by owners of property in the County according to the equalized assessed value of their property. Those with higher value properties pay more, those with lower value properties less. To facilitate the equitable distribution of the tax levy, the Cook County Assessor performs annual updates to a database with the estimated value of each property in the County.

The Cook County Clerk then calculates the tax rate by using the total levy for all taxing bodies to which a given property belongs and the value of the properties within the jurisdiction to calculate the tax rate for a given property. In the Chicago example above, the 2016 levy was $5.9 billion and the total equalized value of property used for calculating the tax rate was $74 billion. The resulting tax rate in Chicago in 2016 was thus 7.145%. Therefore, a property in the City with an equalized assessed value of $100,000 would pay a property tax of $7,145 for the year.

After the tax rate is calculated, the Cook County Treasurer processes and prints the tax bills for each individual property, collects the revenue, and distributes cash to the taxing bodies.

As a result, if properties are not assessed uniformly, some property owners pay more than their fair share of property taxes and some pay correspondingly less. If, for example, low-value homes are overvalued and high-value homes are undervalued, those with lower-value homes pay more than their fair share and those with higher-value homes pay less than their fair share. Such a situation is a regressive tax system, one that transfers wealth from owners of low-value homes to owners of high-value homes. Similarly, if the value estimates for very similar properties are too variable, neighbors in almost identical homes may pay very different effective tax rates.

PROJECT OVERVIEW: FIVE-PHASE APPROACH

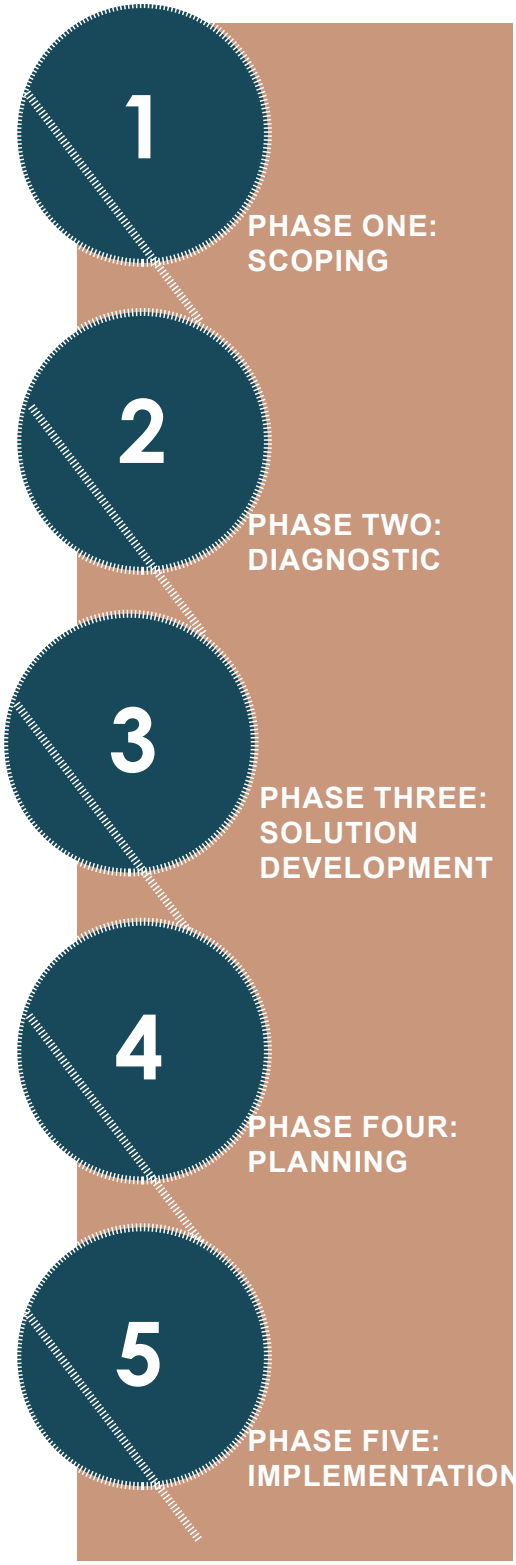
In July of 2017 Cook County Board President Toni Preckwinkle and Cook County Assessor Joe Berrios asked Civic Consulting Alliance (CCA), a non-profit, non-partisan consulting firm, to conduct an independent, pro bono evaluation of Cook County's property tax assessment system, with a focus on residential properties.[1] The goal of this evaluation was not only to assess, but to work alongside the employees in the Assessor's Office and Board of Review to understand the details of the entire assessment process – from data gathering through appeals to the Board of Review – so that changes that might be necessary could be identified and implemented.

Working in close collaboration with the President and Assessor's Office, and with regular input from the Board of Review Commissioners – collectively serving as the Steering Committee for this project – the CCA team and stakeholders agreed in August on a five-phase approach (Figure 1) to the review with go/no-go decisions between each phase:

- **PHASE 1: SCOPING [COMPLETED]:** Define the goals and associated measures of the assessment process, including industry standard target ranges that indicate whether the process is meeting those goals. The Assessor and the Board of Review Commissioners, with the support of the President, agreed on the goals, measures, and target ranges on November 7th 2017.
- **PHASE 2: DIAGNOSTIC [COMPLETED]:** Analyze the outcomes produced by the current end-to-end process for one triennial assessment cycle (covering the three years 2014-2016). Based on the results, identify potential causes of any gaps between the results of the Cook County system and agreed upon standards established in Phase 1. The data request for the data required to perform the analyses was completed by the Cook County Assessor's Office (CCAO) on December 7th. The final results of the analyses were shared with the Assessor, the Board of Review Commissioners, and the President on January 29th 2018. This report was released to the Steering Committee members on February 14th 2018.
- **PHASE 3: SOLUTIONS DEVELOPMENT [STARTED]:** For each area with improvement potential, develop a tactical solution through cross-functional teams with external expertise and staff from the Assessor's Office and the Board of Review – outlining how the area can be improved, within what timeframe, and with what resources.
- **PHASE 4: PLANNING:** Develop an implementation plan for all changes by sequencing initiatives appropriately, ensuring adequate resourcing, and developing oversight and public reporting structures to ensure progress.
- **PHASE 5: IMPLEMENTATION:** Implement initiatives and monitor outcomes, likely over multiple years.

1 The focus of this analysis on residential properties up to 6 units, excluding condominiums. This includes more than 1 million properties (See Appendix).

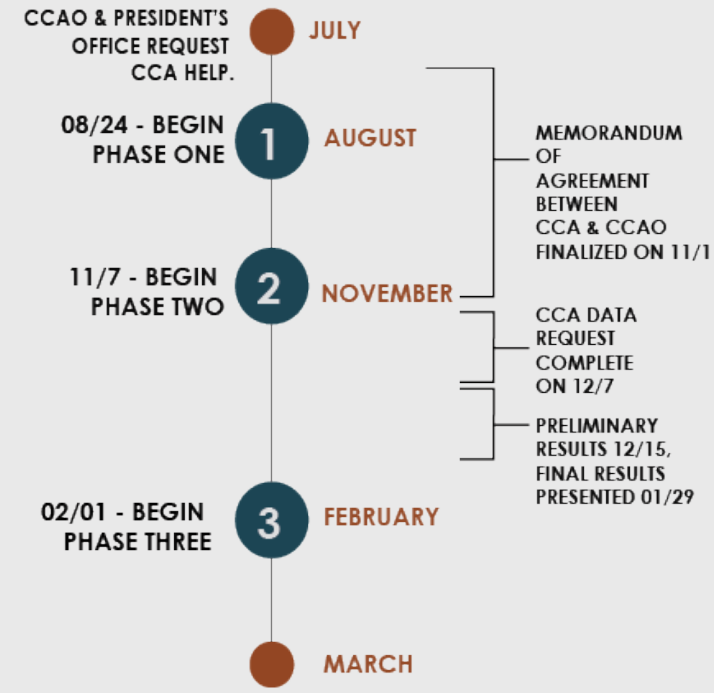
FIGURE 1: FIVE-PHASE APPROACH



Before beginning Phase 1, the CCA team worked with the Assessor's Office to agree on a non-disclosure agreement that would allow the team to work alongside the Assessor's staff and understand the operational details of how assessments are made in Cook County. This agreement, which allowed the analytical work to begin, was completed, signed and communicated by both parties on November 1st, allowing data required for Phase 2 to be requested in early November. At the same time, the CCA team identified and gained agreement from all stakeholders on retaining an independent national expert, Mr. Josh Myers[2], to perform the statistical analyses, provide input on industry best practices and norms, and assist CCA in publishing a public report on the findings of each Phase. Finally, the CCA team, working with Mr. Myers, analyzed practices in other jurisdictions around the country and evaluated the standards supported by the International Association of Assessment Officers (IAAO).

2 See Appendix for Mr. Myers' resume

FIGURE 2: OVERVIEW OF TIMELINE OF PROJECT TO DATE



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PHASE ONE - SCOPING:

GOALS, MEASURES, & TARGETS

On November 7th, the members of the Steering Committee (Assessor, Commissioners of the Board of Review, and the President of the Cook County Board) agreed on four goals that the County's end-to-end assessment process must meet. The four goals are as follows:

- **UNIFORMITY OF ASSESSMENT:** if properties are not assessed uniformly, some property owners pay more than their fair share of property taxes and some pay correspondingly less:
    - If low-value homes are overvalued and high-value homes are undervalued, the result is a regressive tax system, one that transfers wealth from owners of lower-value homes to owners of higher-value homes.
    - Similarly, if value estimates for similar properties are too variable, neighbors in similar homes pay different property tax rates and amounts. This result is not only unfair, but also undermines trust in the system.
- **TIMELINESS OF ASSESSMENT AND PROPERTY TAX BILLS:** if tax bills are not issued on-time, some local governments, especially those with fewer resources, must issue tax anticipation notes to finance their operations while waiting for the required property tax revenue.
- **COMPLIANCE WITH REGULATORY FRAMEWORK:** State and County laws and regulations (Illinois constitution, Illinois statutes, and County ordinances) outline legal requirements for the assessment levels in Cook County that must be complied with.
- **TRANSPARENCY OF THE PROCESS:** Public trust in a system collecting more than $13 billion in revenue per year is paramount. Transparency of outcomes and processes must serve as the foundation to achieving that trust.

For the first of the three goals, specific metrics and target ranges were agreed on to guide the subsequent analysis of the outcomes of the process:

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TABLE 1: GOALS, METRICS, AND TARGET RANGES FOR THE COOK COUNTY ASSESSMENT SYSTEM

		DESCRIPTION	METRIC	TARGET RANGE
GOALS	UNIFORMITY	Similar property to be assessed at the same value with as little variability as possible	Coefficient of Dispersion[3]	5 - 15
		Property of different values to be assessed at the same ratio with as little progressivity or regressivity as possible	Price-related Differential[4] Price-related Bias[5]	0.98 - 1.03 -0.05 - 0.05
	TIMELINESS	Assessment process to be completed to allow for on-time collection of property taxes	Meeting deadlines to allow for timely 2nd installment property tax bills	100%
	COMPLIANCE	Assessment levels (ratio of market value to assessed value for residential properties) in the County consistently in line with ordinance	Assessment ratio (residential)	10%
	TRANSPARENCY	Trust in any government function depends on the public's ability to understand how and on what basis decisions are made	No quantifiable metrics	N/A

3 Coefficient of Dispersion (COD). From the International Association of Assessing Officers' (IAAO) standard on ratio studies: "The most generally useful measure of variability or uniformity is the COD. The COD measures the average percentage deviation of the ratios from the median ratio".

4 Price-related Differential (PRD). From the same standard: "An index statistic for measuring vertical equity is the PRD, which is calculated by dividing the mean ratio by the weighted mean ratio."

5 Price-related Bias (PRB). From the same standard: "The coefficient of price-related bias (PRB) […] is obtained by regressing percentage difference from the median ratio on percentage differences in value."

10 EXAMPLE OF APPLICATION OF COEFFICIENT OF DISPERSION (COD), PRICE-RELATED BIAS (PRB) AND PRICE-RELATED DIFFERENTIAL (PRD)

- **COEFFICIENT OF DISPERSION:** This metric approximates the expected variability in the value estimate of similar homes. For example, if the COD is 15 and the market value of a given property is $100,000, there is a 50% chance that the property is valued between $85,000 and $115,000. As such, 15 is a generous target that allows for considerable variability in value estimates between similar homes.
- **PRICE-RELATED BIAS:** This metric denotes the expected proportionate increase in the assessment level when comparing to a home of twice the value. For example, if the PRB is -0.25, and a $200,000 home is assessed at 10%, a $400,000 would home would be assessed at 7.5% (corresponding to the effective tax rate for the latter home being 25% less than former home).
- **PRICE-RELATED DIFFERENTIAL:** This metric is determined by dividing the mean ratio by the weighted mean ratio. For example, assume a jurisdiction contains two homes, one worth $100,000 assessed at 12% and one worth $1,000,000 assessed at 8% of the fair market value. The mean ratio would be 10% (12%+8% divided by 2) while the weighed mean ratio would be 8.4% (12%*100,000+8%*1,000,000 divided by 1,100,000). The resulting PRD (10% divided by 8.4%) would be 1.20, which indicates a very regressive system.

In addition, to facilitate a comprehensive analysis of the end-to-end process, CCA outlined an analytical framework to guide subsequent evaluation and recommendations. The process contains four steps that each contribute to the final determination of assessed value:

- **MODEL:** Analyze the current outcomes of the modeling phase, processes, and time line to develop models for each township.
- **NOTICE (AFTER ADJUSTMENTS AND "HAND REVIEW"):** Evaluate the post-model adjustments to values performed by the Assessor's Office staff, the impact on uniformity metrics, and the potential for introduction of human variability (i.e., through selective re-appraisal).
- **ASSESSOR FINAL (AFTER APPEALS PROCESS AT CCAO):** Evaluate level of appeals, compare to other jurisdictions, and analyze the impact on uniformity in the Assessor's Office.
- **BOR (AFTER APPEALS PROCESS AT THE BOARD OF REVIEW):** Evaluate the impact of additional, separately elected Commissioners of the Board of Review in evaluating appeals by property owners.

In addition, two components contribute indirectly to determining accurate assessment values:

- **DATA:** Analyze the current quality of property characteristics and sales data.
- **QUALITY ASSURANCE:** Evaluate current processes against industry standards for quality assurance (specifically the use of sales ratio studies).

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PHASE TWO - DIAGNOSTIC: SUMMARY RESULTS OF THE ANALYSIS

On December 7th, the Assessor's Office provided the final sets of data from the assessment cycle for 2014, 2015, and 2016, in which South, Chicago, and North triads were assessed, respectively.[6]

Preliminary results were available on December 15th and were presented for discussion with the Steering Committee. Final results were available on January 29th of 2018 and this report finalized February 14th 2018.

Primary Conclusions from the Diagnostic Phase

- First, outcomes produced by the current system are more variable than industry standard recommend across the County, driven primarily by the variability of assessed values within the City of Chicago (Figure 3).
    - For Chicago, this result approximates that a home worth $100,000 has 50% chance of being assessed between $75,000 and $125,000 and 50% chance of being valued further from its market value.
- Second, outcomes produced by the current system are much more regressive than industry standards recommend – across the County, within each triad, and with the highest levels of regressivity within the City of Chicago (Figure 4).
    - For Chicago, a PRB of -0.24 means that the owner of a $600,000 home would be paying 24% lower effective tax rate than the owner of a $300,000 home.

6 In Cook County, each of three Triads is re-assessed once every three years. In 2014, South Triad was re-assessed; in 2015, Chicago was re-assessed, and in 2016 North Triad was re-assessed.

FIGURE 3: VARIABILITY (COEFFICIENT OF DISPERSION) FOR COUNTY AND EACH TRIAD

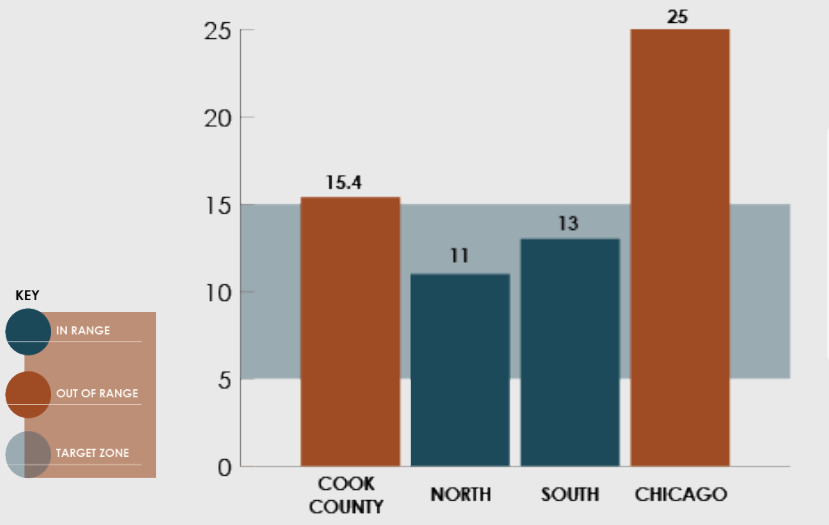
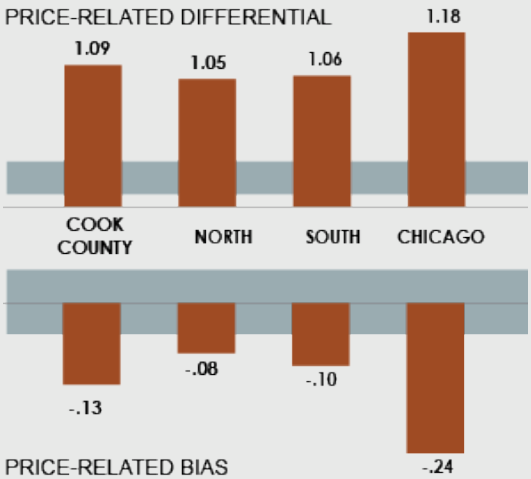


FIGURE 4: REGRESSIVITY FOR COUNTY OVERALL AND EACH TRIAD



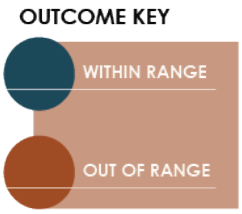


TABLE 2: OVERVIEW OF UNIFORMITY RESULTS BY PROCESS STEP

	GEOGRAPHY	COEFFICIENT OF DISPERSION	PRICE-RELATED DIFFERENTIAL	PRICE-RELATED BIAS
MODEL	County-wide	25	1.14	-0.18
	North triad	17	1.07	-0.08
	South triad	25	1.10	-0.13
	Chicago triad	38	1.33	-0.36
NOTICE *AFTER HAND REVIEW*	County-wide	15.1	1.06	-0.11
	North triad	11	1.03	-0.06
	South triad	14	1.05	-0.10
	Chicago triad	24	1.14	-0.21
ASSESSOR FINAL *AFTER APPEALS AT CCAO*	County-wide	14.6	1.07	-0.12
	North triad	10	1.03	-0.06
	South triad	13	1.05	-0.10
	Chicago triad	24	1.15	-0.22
BOR *AFTER APPEALS AT BOR*	County-wide	15.4	1.09	-0.13
	North triad	11	1.05	-0.08
	South triad	13	1.06	-0.10
	Chicago triad	25	1.18	-0.24

UNIFORMITY

As shown in Table 2, the variability (coefficient of dispersion) improves (and in some cases meets industry standards), while the regressivity increases (becomes worse) as the process moves from Model through Notice (after hand review) to Assessor Final (after CCAO Appeals) and, finally, to BOR (after Board of Review Appeals).

SELECTIVE REAPPRAISAL: TESTING FOR SYSTEMATIC BIAS

In addition to these high-level outcomes, as a test for systematic bias in an assessment system, the IAAO outlines standards for evaluating "selective reappraisal," which if present indicates that results of an assessment system are skewed in a way that assessments appear better in quality assurance statistics than they are in reality.

Per IAAO "If sold and unsold properties within a specified group are appraised in the same way, their appraised values should reflect similar average percentage changes […]. Accordingly, changes in appraised values for sold and unsold parcels can be compared to determine whether sold parcels have been selectively appraised."[7]

While Cook County does not track the data that would give an even better indication of true appraisal performance in the presence of selective reappraisal, a comparison of the percentage changes in value between sold and unsold parcels suggests that selective reappraisal is present in the Cook County assessment process.

The IAAO "Standard on Ratio Studies" (Part 1, section 4.5) states the following: "[…] if parcels that sell are selectively reappraised based on their sale prices and if such parcels are in the ratio study, uniformity inferences will not be accurate (appraisals appear more uniform than they are)." Thus, there is high likelihood that outcomes from the end-to-end assessment process are actually less uniform than shown in Table 2.

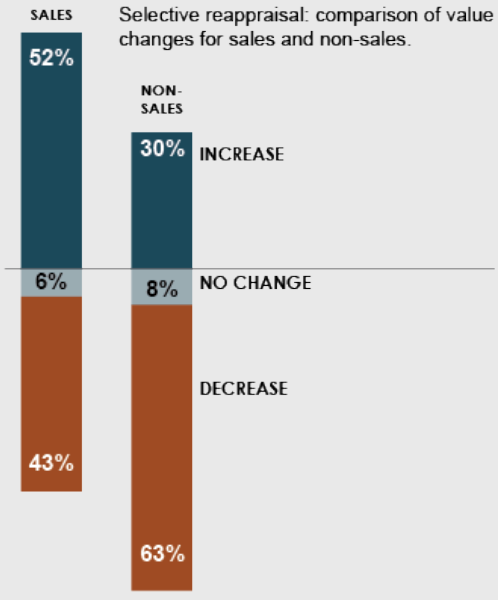
TIMELINESS

The different stakeholders in the end-to-end process (Cook County Assessor, Commissioners of the Board of Review, the State Department of Revenue, the Cook County Clerk, and the Cook County Treasurer) have collaborated to successfully issue second installment tax bills on time for 6 years running after decades without achieving this outcome.

This is an important improvement to the system, saving local units of government on interest payments on tax anticipation loans. Moreover, it is an example of change being possible when cross-functional teams collaborate to develop operational plans to improve the system. This same approach can be applied to the common goal of reducing of variability and regressivity in the assessment and appeals system.

7 International Association of Assessing Officers, Standard on Ratio Studies

FIGURE 5: VALUE CHANGES BETWEEN MODEL AND NOTICE STEPS FOR SALES AND NON-SALES, RESIDENTIAL PROPERTIES



COMPLIANCE

State and County regulations outline specific parameters within which assessment levels in Cook County must operate. Residential property should be assessed at 10% of its fair market value. If so, the "assessment ratio" is 10.0. As shown below, Cook County appears to meet this target.

TABLE 3: OVERVIEW OF ASSESSMENT RATIO (RESIDENTIAL) FOR COUNTY OVERALL AND EACH TRIAD

ASSESSMENT RATIO
TARGET RANGE | 10%

GEOGRAPHY	COUNTY-WIDE RESULTS
County-wide	10.0
North triad	10.0
South triad	10.0
Chicago triad	10.0

TABLE 4: OVERVIEW OF ASSESSMENT RATIO (RESIDENTIAL) BY PROCESS STEP

	COUNTY-WIDE	NORTH	SOUTH	CHICAGO
MODEL	10.4	10.2	10.3	10.8
HAND REVIEW	10.2	10.3	10.0	10.4
APPEALS (CCAO)	10.0	10.0	10.0	10.1
APPEALS (BOR)	10.0	10.0	10.0	10.0

OUTCOME KEY
WITHIN RANGE
OUT OF RANGE

TRANSPARENCY

The team did not assess transparency of the current system quantitatively but does note that IAAO standards call for conducting and making public sales ratio studies and other tests of the uniformity of the system at each stage of the process.

THREE MAIN DRIVERS OF VARIABLE AND REGRESSIVE OUTCOMES

In addition to the overall analytical results, the CCA team analyzed the outcomes after each step of the assessment process to identify specific opportunity areas for improvement, as a precursor to Phase 3.

- **MODEL:** The values produced by the model (multiple regression analysis) are outside target range for all uniformity metrics. There is substantial room for improving modeling practices and staffing allocation practices to ensure better modeling results within the Assessor's Office.
- **HAND REVIEW:** The subsequent adjustments to the model output (hand review) improve the overall results but also introduce selective reappraisal. That is, systematic bias is introduced into the process and actual improvements in outcomes are exaggerated.
- **APPEALS (ASSESSOR'S OFFICE AND BOARD OF REVIEW):** One striking feature of the Cook County system is its unusually high number of appeals when compared to other jurisdictions in the United States and abroad. While every local jurisdiction has its own regulatory framework and mindsets that impact the number of appeals, the levels of appeals in Cook County are very high and increase regressivity.
  - **LEVEL OF APPEALS:** In the last triennial (2014-2016) 20-30% of all properties appealed their value at the Assessor's Office, the Board of Review, or both. In 2016, 56% of newly reassessed properties in the North triad appealed their value. As shown in Figure 6, Cook County relies much more on appeals than other assessment jurisdictions – for Cook County, the appeal levels are more than 20 times higher than benchmark jurisdictions.
  - **VALUE OF HOMES THAT ARE APPEALED:** There is a strong correlation between the value of the home and the propensity to appeal (Figure 7). Owners of higher-value homes appeal at much higher rates than owners of lower-value homes, and because the share of appeals leading to reductions does not correlate with the value of the homes, this pattern leads to an increase in regressivity of the current system.
  - **SHARE OF REDUCTIONS:** Between 34-64% of all properties appealed are granted reductions at the Assessor's Office, Board of Review, or both (Figure 8). This contributes to increasing the variability and regressivity in the outcomes from the system.

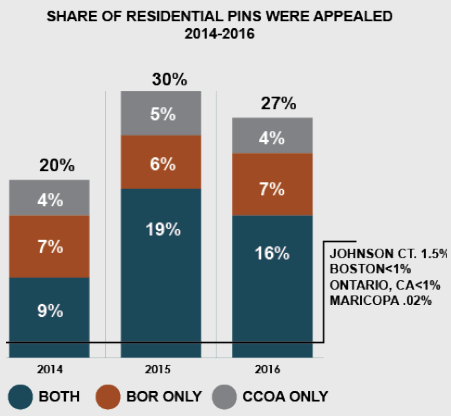


FIGURE 6:
RESIDENTIAL REAL ESTATE ASSESSMENT APPEALS IN COOK COUNTY AND OTHER JURISDICTIONS

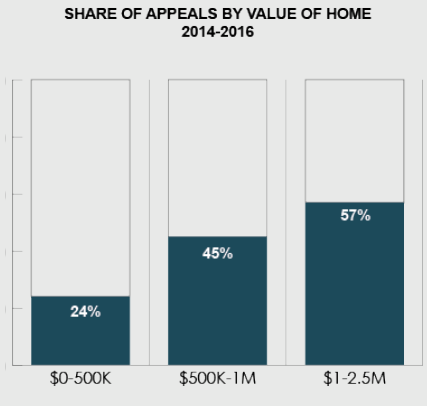


FIGURE 7:
APPEALS RATE BY VALUE OF HOME

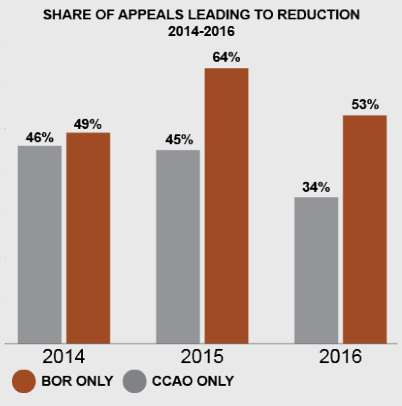


FIGURE 8:
SHARE OF APPEALS LEADING TO REDUCTION IN ASSESSED VALUE

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PHASE THREE - SOLUTION DEVELOPMENT:

PRELIMINARY DRIVERS TO IMPROVE OUTCOMES

Since reviewing the results of Phase 2 on January 29th 2018, the CCA team has begun to facilitate workshops to develop joint solutions with the relevant stakeholders at each step in the process. These workshops are focused on addressing the main drivers of the current outcomes that were identified during Phase 2. Using the process step analytical framework, potential improvement in each step of the process include:

- **MODEL**
  - Optimize current modeling logic and process to improve output from model to reduce variability and regressivity.
  - Improve staffing resources for developing and maintaining quality assurance of the assessment model.
  - Overhaul current IT infrastructure, both in the very short term to allow for improvements during the Chicago reassessment in 2018, as well as ensuring implementation of iasWorld by Tyler Technologies includes substantial model improvements.
- **HAND REVIEW**
  - Establish processes requiring fewer personnel hours in order to redeploy resources for modeling and quality assurance.
  - Closely monitor the impact of processes on selective reappraisal, which introduces systematic error into the process and makes quality more difficult to monitor.
  - Improve hand review process with technology to reduce the scope of review.
- **APPEALS (ASSESSOR'S OFFICE AND BOARD OF REVIEW):**
  - Overtime, reduce the number of appeals granted reductions by the Assessor's Office on the basis of uniformity, instead focusing on correcting factual errors in property characteristics.
  - Evaluate potential for reducing the number of appeals on uniformity at the Board of Review. Up to 64% of appeals in the last triennial were granted a reduction at the Board of Review, which will likely be reduced sharply as the uniformity and accuracy of assessed values by the Assessors' office improve.
  - Reducing appeals will in turn reduce the variability and regressivity currently introduced by this process step.

- **DATA:**
  - Conduct one-time update of property data characteristics through use of technology and time-limited addition of resources.
  - Establish ongoing monitoring of quality of data and ensure continuous update of property characteristics.
  - Perform in-house validation of sales data used in modeling phase, and store multiple years of sales data to facilitate sales ratio studies, building of models, as well as performing analysis of selective reappraisal.
- **QUALITY ASSURANCE**
  - Perform sales ratio studies on an ongoing basis, at least after the completion of each process step for each township. This will allow for managing uniformity outcomes more directly and ensure lower variability and regressivity.
  - Publish the results of the sales ratio studies, as they are completed.

Workshops will include all relevant stakeholders and decision-makers to facilitate as rapid progress as possible. The output from each workshop will be consolidated into a tactical implementation plan (Phase 4) for the Assessor's Office and the Commissioners of the Board of Review to execute and to which to hold each other accountable (Phase 5).

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ABOUT CIVIC CONSULTING ALLIANCE

Civic Consulting Alliance's mission is to make the Chicago region a great place for everyone to work and live in. By leveraging the support of the Civic Committee of the Commercial Club of Chicago (collectively the major private employers in the region) with incomparable professional resources and committed leaders, CCA provides consulting services to clients to help address the region's most pressing problems and greatest opportunities in four areas: Education; Criminal Justice and Public Safety; Economic Vitality; and inclusive Civic Leadership.

At no cost to the taxpayer, CCA works on a pro bono basis with governmental and not-for-profit clients who commit to collaborate on important strategic and operational change and achieve significant reforms. In Fiscal Year 2017, 37 partner firms provided pro bono support for 54 cross-sector projects. Together, CCA, its partners, and its clients accomplish more than any one firm or sector can on its own.

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THIS DOCUMENT IS A COMPANION APPENDIX TO ***RESIDENTIAL PROPERTY ASSESSMENT IN COOK COUNTY***, A REPORT DEVELOPED BY THE CIVIC CONSULTING ALLIANCE FOR THE COOK COUNTY BOARD OF COMMISSIONERS AND THE COOK COUNTY ASSESSOR

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APPENDIX CONTENTS

DETAILED STATISTICAL ANALYSIS

ANALYTICAL RESULTS: HIGH-LEVEL DESCRIPTIVE STATISTICS

Table 5: Descriptive Statistics for Residential properties in Cook County

Post-BOR Assessments	South Triad	City Triad	North Triad	Overall
COUNT OF PROPERTIES	338,146	410,292	275,623	1,024,061
MIN	$317	$2	$611	$2
MAX	$480,407	$1,429,800	$2,800,081	$2,800,081
MEDIAN	$14,549	$19,851	$28,602	$20,399
MEAN	$17,885	$25,473	$36,468	$25,927
STANDARD DEVIATION	$13,100	$22,504	$28,988	$23,175

Table 6: Descriptive Statistics for Sales of Residential properties in Cook County

Sale Price	South Triad	City Triad	North Triad	Overall
COUNT	5,617	5,861	11,175	22,653
MIN	$11,500	$10,000	$15,896	$10,000
MAX	$5,102,013	$7,400,000	$7,000,000	$7,400,000
MEDIAN	$191,000	$283,000	$292,500	$266,000
MEAN	$254,696	$426,653	$387,250	$364,577
STANDARD DEVIATION	$223,033	$480,419	$337,484	$363,963

ANALYTICAL RESULTS: UNIFORMITY

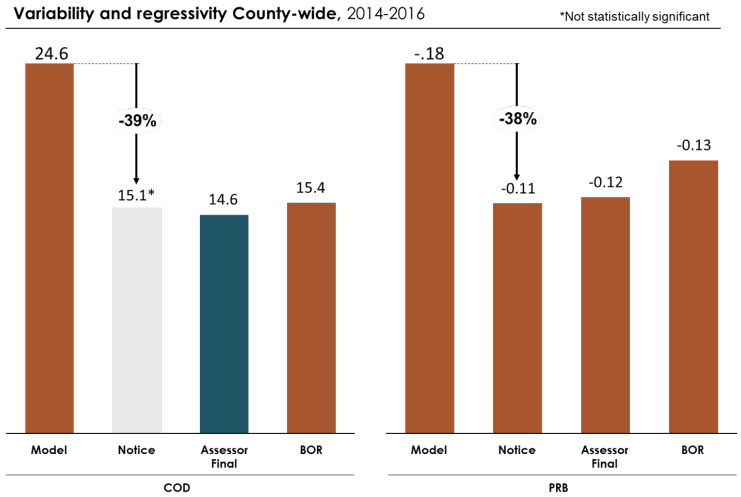


Figure 9: Variability (COD) and Regressivity (PRB) County Overall

Key finding: Starting point values after Model process step are poor, with the largest improvement being between Model and Notice process steps.

- For the model step in the County as a whole, the coefficient of dispersion (COD) is 24.6 the coefficient of price-related bias (PRB) is -0.18.
- These COD and PRB numbers are both worse than in the other subsequent steps.
- The largest improvement is when moving from the model to notice step, with a 39% improvement in the COD and a 38% improvement in the PRB.

ANALYTICAL RESULTS: UNIFORMITY CONTINUED

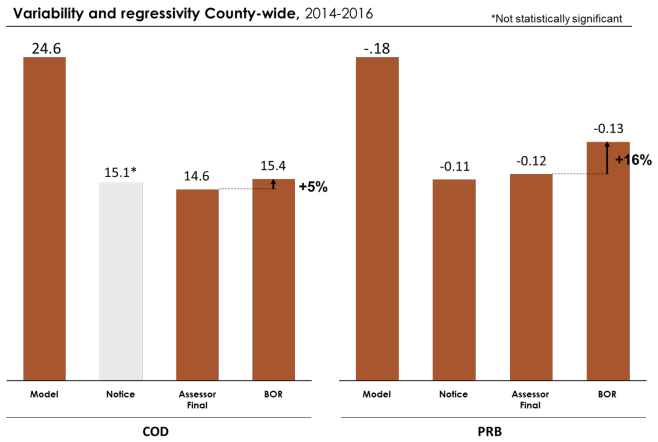


Figure 10: Variability (COD) and Regressivity (PRB) County Overall

Key finding: Results in the City of Chicago are worse than in the North triad or the South triad.

- The County-wide COD in the BOR step is 15.4, which is 5% higher than the COD in the Assessor Final step, indicating increased variability.
- The County-wide PRB in the BOR step is -0.13, which is 16% higher than the PRB in the Assessor Final step, indicating increased regressivity.

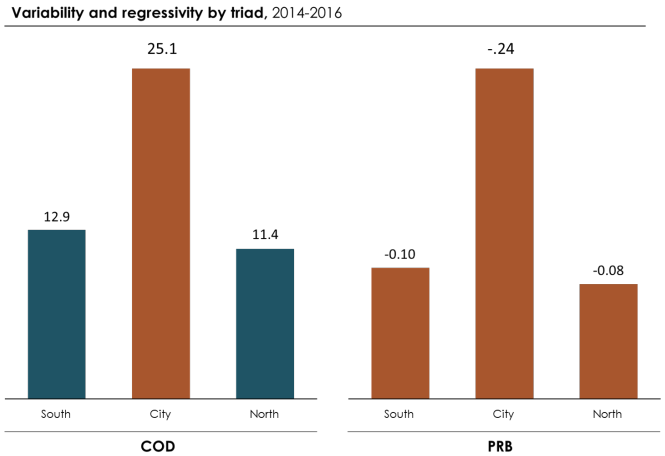
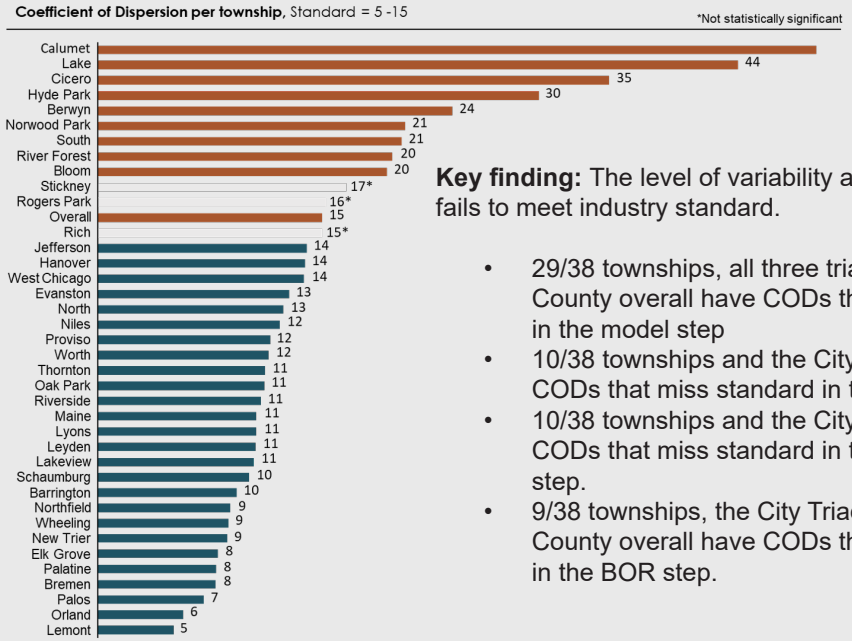


Figure 11: Variability (COD) and Regressivity (PRB) by Triad

Key finding: Results in the City of Chicago are worse than in the North triad or the South triad.

- The Coefficient of Dispersion (COD) is higher across all four steps within the City of Chicago compared to North and South triad.
- Regressivity is greater in all four steps in the City of Chicago compared to North and South triad.

Figure 12: Variability (COD) by Township after BOR



Key finding: The level of variability across Cook County often fails to meet industry standard.

- 29/38 townships, all three triads, and the County overall have CODs that miss standard in the model step
- 10/38 townships and the City Triad have CODs that miss standard in the notice step.
- 10/38 townships and the City Triad have CODs that miss standard in the assessor final step.
- 9/38 townships, the City Triad, and the County overall have CODs that miss standard in the BOR step.

ANALYTICAL RESULTS: UNIFORMITY CONTINUED

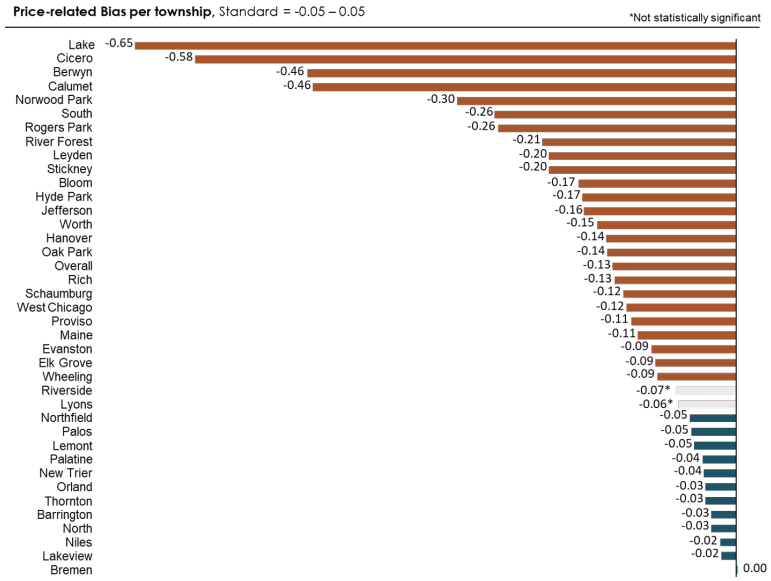


Figure 13: Price-related Bias per Township after BOR

Key finding: The level of regressivity across Cook County is often more than industry standards permit.

- No township or Triad has unacceptable levels of progressivity at any step of the process.
- 29/38 townships, all three triads, and the County overall have unacceptable regressivity in the model step.
- 18/38 townships, all three triads, and the County overall have unacceptable regressivity in the notice step.
- 16/38 townships, all three triads, and the County overall have unacceptable regressivity in the assessor final step.
- 19/38 townships, all three triads, and the County overall have unacceptable regressivity in the BOR step.
- The median ratio in the first value decile is 12.2% and the median ratio in the tenth value decile is 9.6%. This means that a high-valued home in the tenth value decile is paying an effective tax rate due to assessment that is approximately 21% lower than a low-valued home in the first value decile. This also means that a low-valued home in the first value decile is paying an effective tax rate due to assessment that is approximately 22% higher than if their median ratio met the 10% standard.

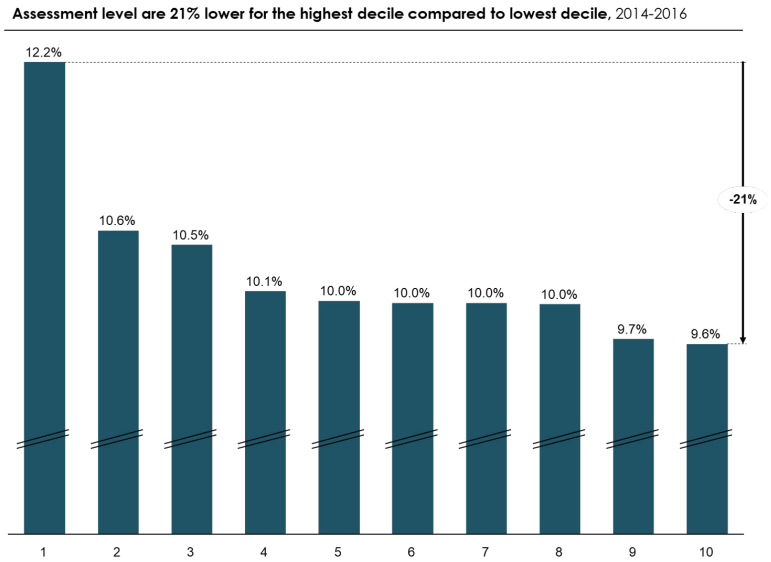


Figure 14: Assessment Ratio by Decile of Value of Property after BOR

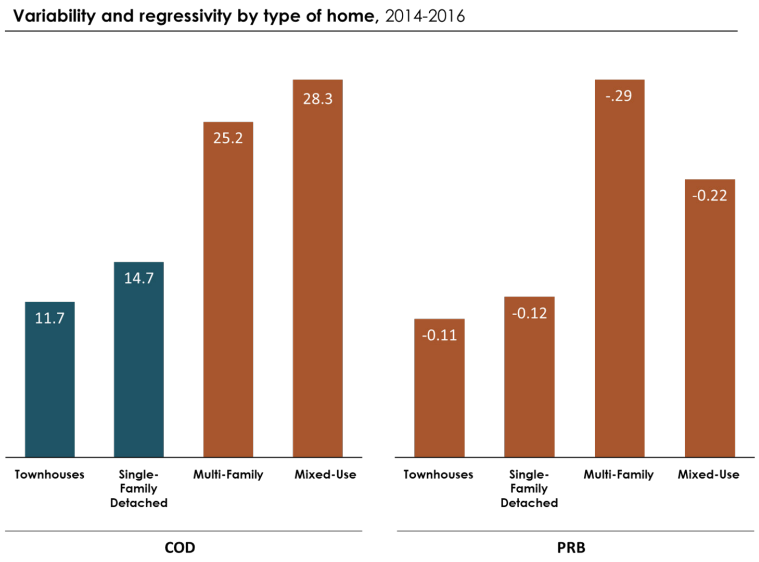


Figure 15: Variability and Regressivity by Type of Home

Key finding: The variability and vertical inequity for Townhouses and Single-Family Detached properties are better than for Multi-Family and Mixed-Use properties. Also, to a lesser degree, Townhouses have better results than Single-Family Detached properties.

ANALYTICAL RESULTS: SELECTIVE REAPPRAISAL

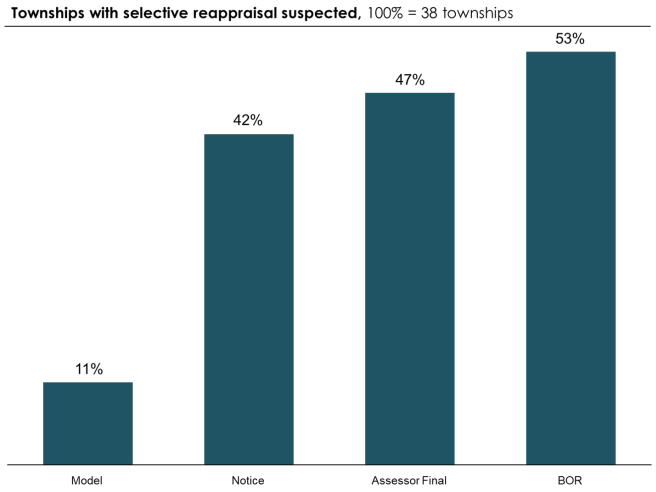


Figure 16: Townships with Selective Reappraisal Suspected

Key finding: Selective Reappraisal is suspected in certain strata.

- 4/38 townships are suspected of selective reappraisal in the model step.
- 16/38 townships, the City Triad, and the County overall are suspected of selective reappraisal in the notice step.
- 18/38 townships, all three Triads, and the County overall are suspected of selective reappraisal in the assessor final step.
- 20/38 townships, all three Triads, and the County overall are suspected of selective reappraisal in the BOR step.

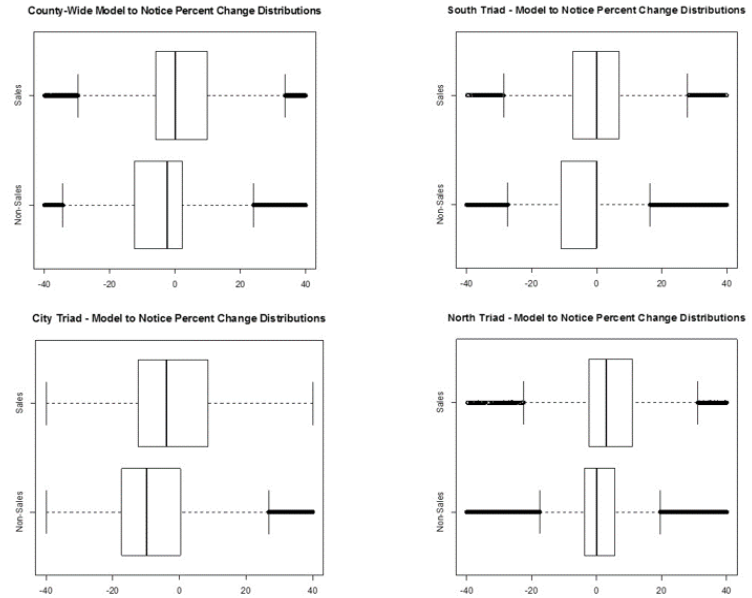


Figure 17: Patterns of Change from Model to Notice Step, Sales vs. Non-sales

Key finding: The majority of selective reappraisal is added in the Notice step.

- The distribution of percent changes between the Model and Notice assessed values are different for the non-sales when compared to the sales. This is true for each triad and County-wide. The four boxplots the show the comparison of these distributions. The range of the central box, denoting the first to third quartile of the distribution, is more narrow for the non-sales than for the sales for each set of boxplots, meaning that the sales are undergoing larger percent changes than the non-sales. Also, the line in the center of the central box, denoting the median of the distribution of percent changes, is less for the non-sales than for the sales for each set of boxplots, indicating that the non-sales are receiving a greater value reduction at this stage than the sales.
- When comparing changes since the previous triennial reassessment, the number of townships suspected jumps from 4 at the model step to 16 at the notice step, a much larger increase than at the other process steps.
- When only comparing changes between the Model and Notice steps, 23/38 townships, as well as the County overall, are suspected of selective reappraisal. This is an increase over the 16/38 townships that were already suspected of selective reappraisal at the notice step when using the previous analysis that compared percent changes since the same step of the last triennial reassessment.
- The distribution of sale and non-sale percent changes are different between the Model and Notice step for each triad and overall.
- Overall, for sales: 51.58% receive an increase and 42.76% receive a decrease; for non-sales: 29.64% receive an increase and 62.63% receive a decrease.
- Some selective reappraisal is added at the Assessor Final and BOR Steps. However, this not unexpected at these steps to the very high number of appeals, and the fact that sales have their values changes more often than non-sales at these stages (16.99% vs. 13.85% in the Assessor Step; and 23.70% vs. 14.57% in the BOR step).

ANALYTICAL RESULTS: SELECTIVE REAPPRAISAL CONTINUED

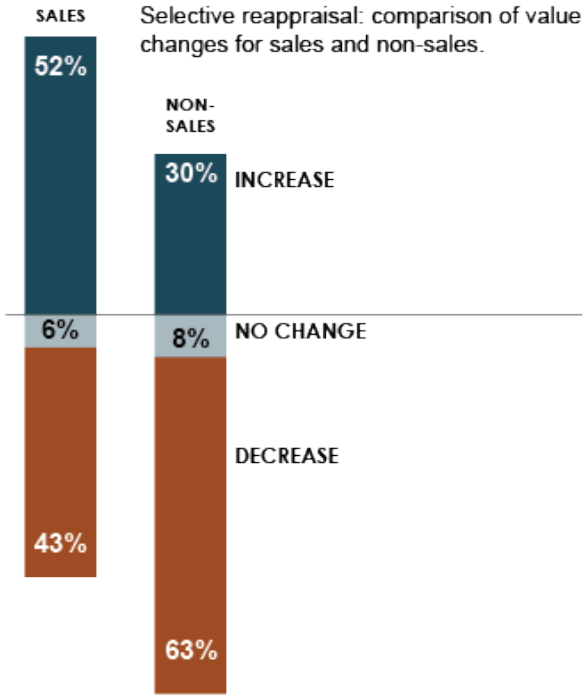


Figure 18: Comparison of Value Changes for Sales and Non-sales between Model and Notice Steps

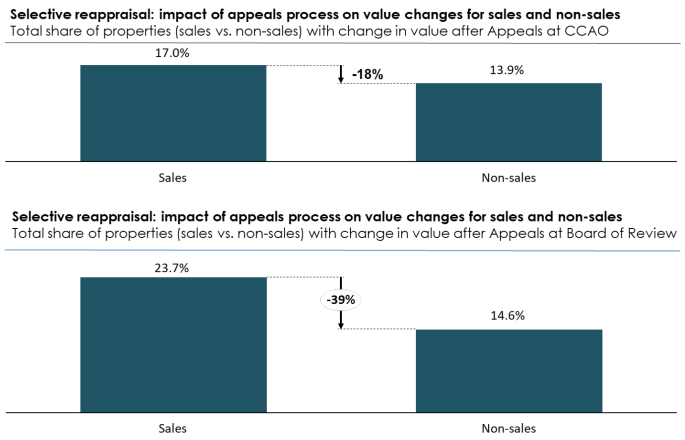


Figure 19: Selective Reappraisal Throughout Appeals Process

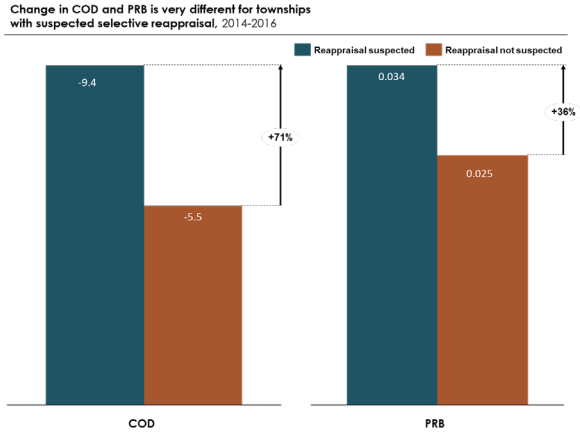


Figure 20: Change in COD and PRB for Townships Suspected of Selective Reappraisal vs. Not Suspected

Key finding: This level of selective appraisal likely artificially improves ratio performance in the Notice, Assessor final, and BOR process steps. Highly indicative of this, between the Model and Notice steps, new townships suspected of selective reappraisal have a greater reduction in COD and PRD than townships not suspected of selective reappraisal.

- The reduction in coefficient of dispersion (COD) is 71% greater in townships suspected of selective reappraisal when compared to townships not suspected.
- The reduction in price-related differential (PRD) is 36% greater in townships suspected of selective reappraisal when compared to townships not suspected.

ANALYTICAL RESULTS: COMPLIANCE (ASSESSMENT LEVEL)

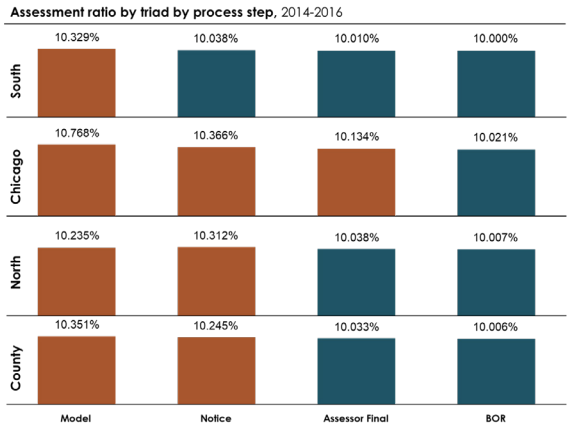


Figure 21: Assessment Ratio Per Triad by Process Step

Key finding: As the valuation process progresses, the overall County-wide, class code range, and triad-specific assessment level declines. After the BOR step, the standard of 10% is met for each triad, each class code range, and County overall.

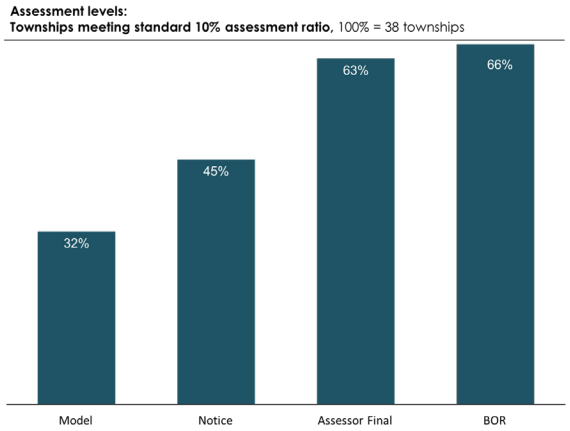


Figure 22: Share of Townships meeting Assessment Ratio

Key finding: The assessment level across Cook County often fails to meet industry standard by Township.

- 26/38 townships, all three triads separately, and the County as a whole fail to make the median standard at the Model Phase.
- 21/38 townships, the North and City Triads, and the County as a whole fail to make the median standard at the Notice Phase.
- 14/38 townships and the City Triad fail to make the median standard at the Assessor Final Phase.
- 13/38 townships fail to make the median standard at the BOR Phase.

ANALYTICAL RESULTS: COMPLIANCE (ASSESSMENT LEVEL) CONTINUED

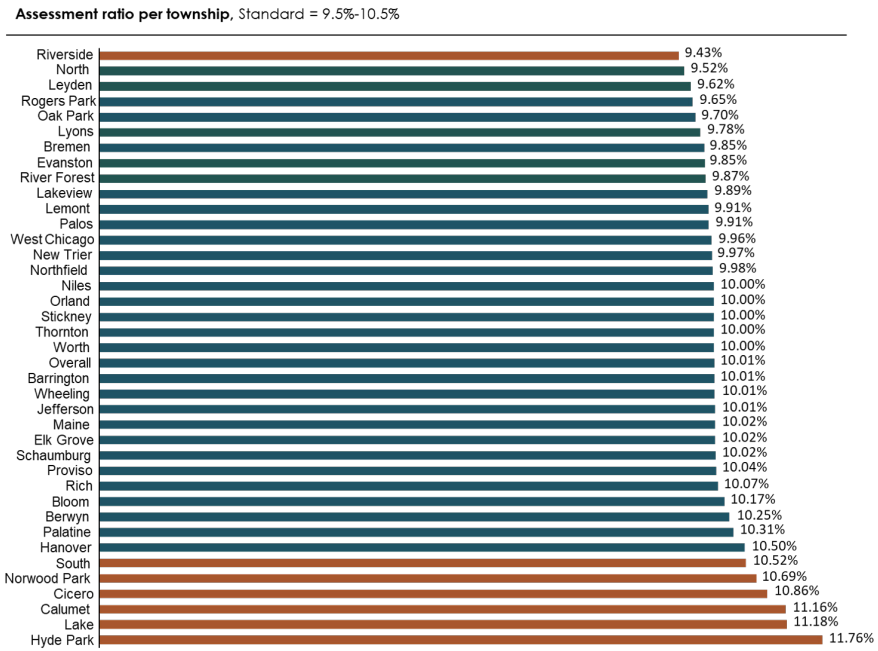


Figure 23: Assessment ratio per Township

Key finding: Township median assessment ratios vary more than industry standards permit and 13 townships do not meet the agreed-upon standard.

- 19/38 townships do not have their median ratio within 5% of the county-wide median ratio in the model step.
- 5/38 townships do not have their median ratio within 5% of the county-wide median ratio in the notice step.
- 7/38 townships do not have their median ratio within 5% of the county-wide median ratio in the assessor final step.
- 7/38 townships do not have their median ratio within 5% of the county-wide median ratio in the BOR step.

ANALYTICAL RESULTS: PERCENT CHANGE

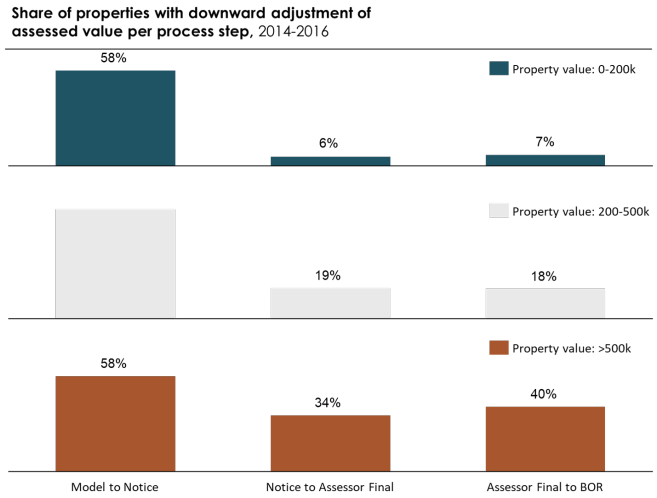


Figure 24: Share of Properties with Reduced Assessed Value by Process Step

Key finding: Properties with higher values tend to receive more reductions in the appeals process at Assessor and Board of Review

- The transition from the Model to the Notice phase produces similar percent changes at different market values.
- However, due to frequency of appeals being much higher for higher-value homes:
  - 34.44% of properties worth more than 500k receive a reduction at the Assessor Appeals phase, compared to only 5.56% worth less than 200k
  - 39.86% of properties worth more than 500k receive a reduction at the Assessor Appeals phase, compared to only 6.68% worth less than 200k

ANALYTICAL RESULTS: PERCENT CHANGES CONTINUED

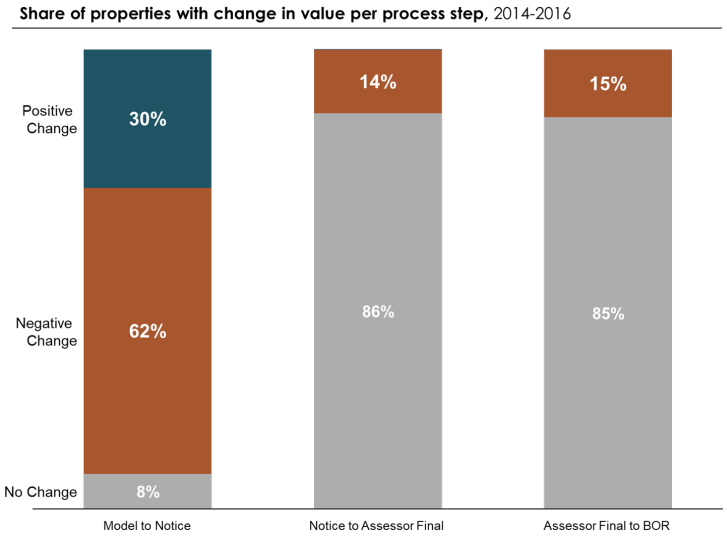


Figure 25: Share of Properties with Change in Value by Process Step

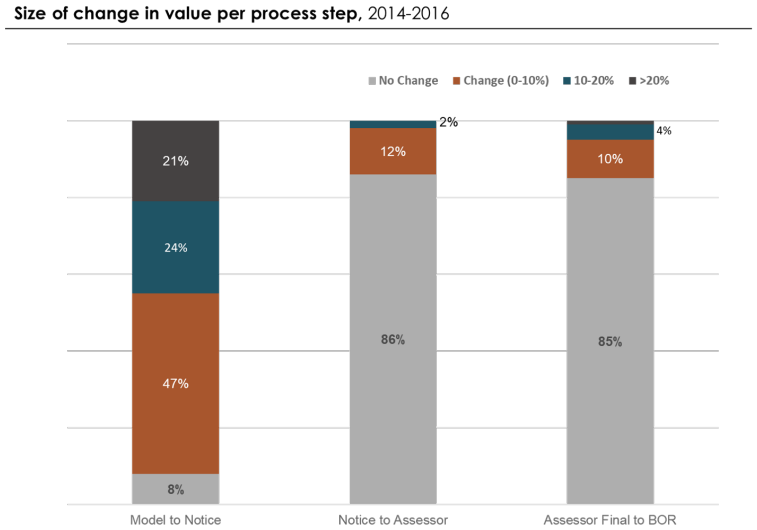


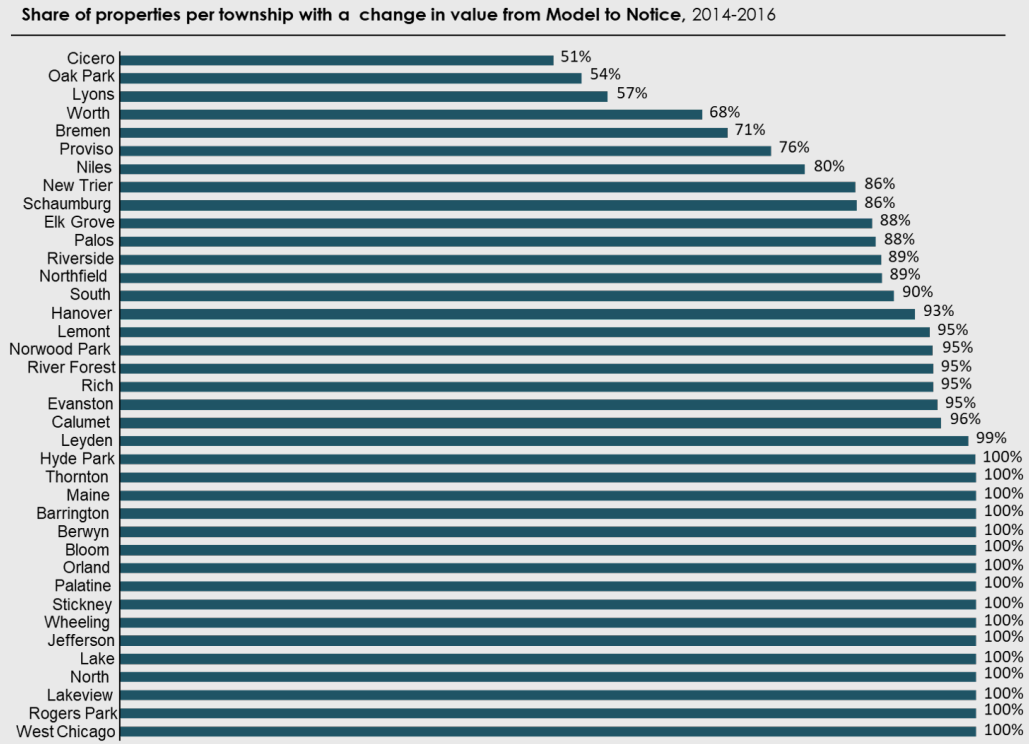
Figure 26: Size of Change in Value per Process Step

Key Finding: In the Model to Notice transition, properties change value by township with varying frequencies. Hand review and post-model adjustments impact model values in some townships more than others.

Key finding: In comparing the three sets of value transitions in the 2014 - 2016 triennial (Model to Notice, Notice to Assessor Final, and Assessor Final to BOR), the largest and most frequent changes come in the Model to Notice transition (caused by the hand review and post-model adjustments).

- 92.32% of properties receive a change in the Model to Notice transition in hand review and post-model adjustments, compared to 13.90% of properties in the Notice to Assessor Final transition and 14.76% of properties in the Assessor Final to BOR transition.
- 45.52% of properties receive a change of at least 10% in the Model to Notice transition, compared to the Notice to Assessor Final transition (1.93%) and the Assessor Final to BOR transition (5.11%).

Figure 27: Share of Properties by Township with Change in Value from Model to Notice



ANALYTICAL RESULTS: DATA QUALITY

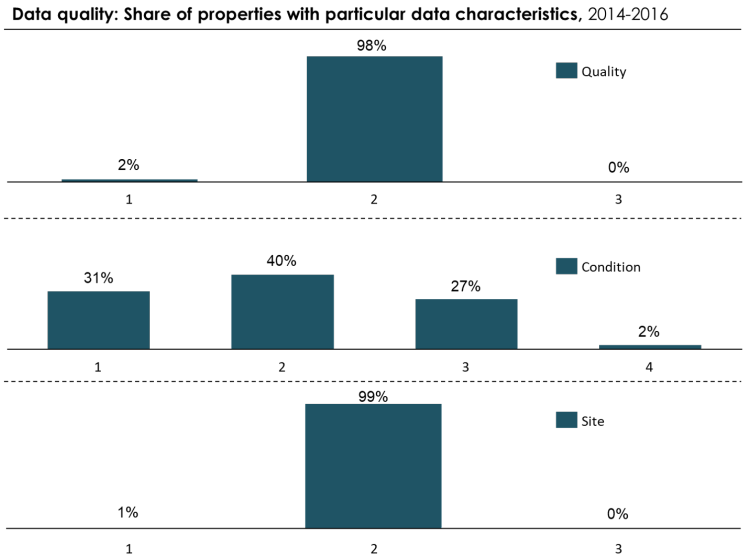


Figure 28: Histogram of Property Characteristics (Quality, Condition, and Site)

Key finding: The data quality for quality, condition, and site, important subjective variables, is poor due to a limited data range, insufficient value representation, and inconsistent data application. This precludes their effective use in mass appraisal modeling.

- Quality has only three categories, which is less than adequate for such an important value predictor, and these three categories are insufficiently represented in the data, with 98% of the values being category 2.
- Condition, while having an adequate number of categories, only utilizes the fourth category 2% of the time.
- The three categories for site are insufficiently represented in the data, with 99% of the values being category 2.
- In addition, the data has been inconsistently applied for quality, site, and condition, because there is no proper relationship between the level and the price per square foot for any of these variables.

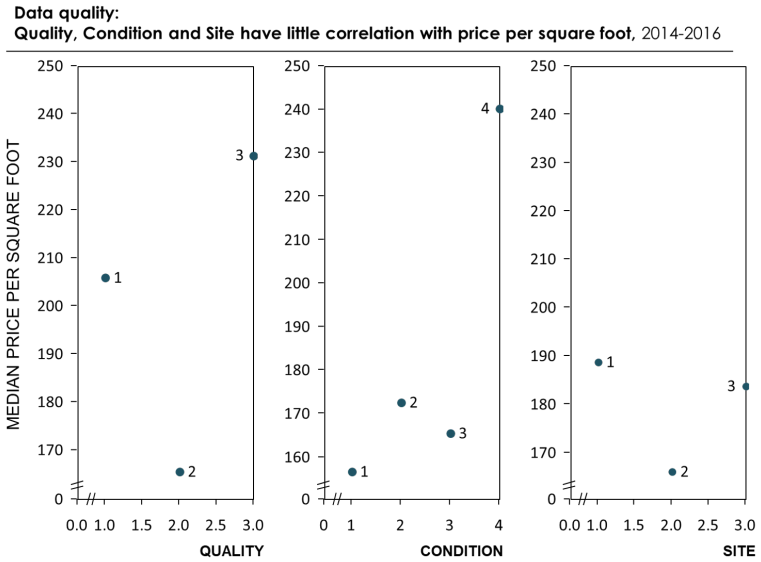


Figure 29: Correlation between Data Characteristics and Price per Sq.Ft.

DATA DESCRIPTION AND STUDY PLAN

- All data was provided by the Cook County Assessor's Office.
- The analysis measured the results after each of the four process steps:
    - **MODEL** (output from modeling phase)
    - **NOTICE** (value on assessment notices sent by Assessor's Office)
    - **ASSESSOR** Final (value after Appeals in the Assessor's Office), and
    - **BOR** (value after Appeals in the Board of Review).
- Assessment values from 2014 (South Triad), 2015 (City), and 2016 (North Triad) were used to measure the latest County-wide triennial assessment.
- Sales from the year before the revaluation were used for the ratio study: 2013 (South Triad), 2014 (City), and 2015 (North Triad).
- Stratification
    - County-wide
    - Triad
    - Township
    - Class Code Groupings within Townships
    - Class Code Groupings overall
- The analysis is focused only on residential improved class code 2-xx "regression" classes, not including residential land. These properties are all valued using the same model. This analysis does not include condominiums, which use a different process for valuation altogether and cannot be combined. These class codes constitute the majority of parcels in the County.
- The Class Code Grouping used are as follows:
    - Townhouses: 210 and 295
    - Single-Family Detached: 202, 203, 204, 205, 206, 207, 208, 209, 234, and 278
    - Multi-Family: 211
    - Mixed-Use: 212
- Outlier Trimming is based on 1.5*IQR log-adjusted criterion at the Township level separately at each step.
- Time adjustments are not performed
    - One year of sales is used and so time adjustments are less necessary.
    - Full sale dates are missing for 42.01% of the sales (9516 total missing out of 22653 - 0 from South, 683 from City, 8833 from North), and basing a time trend on a reduced data set would not be wise.
- Sale Data Filters Used
    - No sales with multiple classes.
    - No sale prices less than 10k.
    - No sale prices more than 10mil.
    - The only qualification code is the Assessment "Pure Market" Flag, which identifies distressed sales only. Non "Pure Market" sales are not considered for this ratio analysis.
    - The County did not collect "Pure Market" flags for every township , but the ratio study uses it when available.
    - No other sales validation codes are available for use.
- Other Notes
    - Statistical Tests will be used to make decisions about whether a particular statistic meets the relevant Standard.
        - 90% two-sided confidence intervals are calculated for the Median Ratio, COD, PRD, and PRB.
        - These 90% two-sided confidence intervals act in practice as a one-sided statistical test at the alpha = 5% level when making a comparison to a Standard
        - For the median ratio, statistical tests are performed after rounding to the nearest tenth of a decimal place.
    - The Assessor's Office does not keep a property attribute history at time or sale or assessment making it impossible to eliminate properties that have changed class or use.

ANALYSES PERFORMED

- Ratio Study
    - Median Ratio (Standard 10%)
    - Coefficient of Dispersion (COD) (Standard 5 - 15)
    - Price-Related Differential (PRD) (Standard 0.98 to 1.03) and Price-related Bias (Standard -0.05 to 0.05)
        - Missing both constitutes failure to meet the vertical inequity Standard.
    - Selective Reappraisal
        - Failure is missing one of three tests below.
            - Measured by comparing distributions of percent changes between a step and the corresponding step in the last triennial or between steps in the same triennial.
                - Median Percent Change greater than 3 percentage points and significant on the Mann-Whitney Test (1)
                - Median Absolute Deviation greater than 3 percentage points and significant on the Mann-Whitney Test (2)
            - Stratum Coefficient of Dispersion is statistically significantly less than 5% (3)
- Comparison of Results Between Steps
- Comparison of Results within Steps
- Percent Change Analysis
    - Between steps
    - Sales vs. non-sales
    - Across market value categories
- Evaluation of property data quality
    - Variables Analyzed
        - Site
        - Quality
        - Condition
    - Analysis Type
        - Is data variance and representation appropriate?
    - Is there a clear price-per-square foot relationship?

ANALYTICAL RESULTS: TABLES

SALE AND NON-SALE PERCENT CHANGES BY GEOGRAPHY

		CITYWIDE		SOUTH		CHICAGO		NORTH	
		SALES	NON-SALES	SALES	NON-SALES	SALES	NON-SALES	SALES	NON-SALES
MODEL TO NOTICE	PERCENT POSITIVE CHANGES	51.58	29.64	40.48	21.61	47.4	26.94	59.33	43.87
	PERCENT NEGATIVE CHANGES	42.76	62.63	46.43	61.35	52.19	72.72	36.03	48.84
	PERCENT NO CHANGE	5.66	7.72	13.09	17.04	0.4	0.34	4.64	7.3
NOTICE TO ASSESSOR FINAL	PERCENT POSITIVE CHANGES	0	0.01	0.02	0.02	0	0	0	0
	PERCENT NEGATIVE CHANGES	16.99	13.84	12.02	9.73	12.55	9.37	21.79	25.84
	PERCENT NO CHANGE	83.01	86.15	87.96	90.26	87.45	90.63	78.21	74.16
ASSESSOR TO FINAL BOR	PERCENT POSITIVE CHANGES	0	0	0	0	0.02	0	0	0
	PERCENT NEGATIVE CHANGES	23.7	14.57	16.46	11.06	20.11	10.18	29.21	25.68
	PERCENT NO CHANGE	76.29	85.43	83.54	88.94	79.88	89.82	70.79	74.32

COUNTY-WIDE - PERCENT CHANGES BY MARKET VALUE RANGE

	MODEL TO NOTICE			NOTICE TO ASSESSOR FINAL			ASSESSOR TO BOR		
	Percent Positive Changes	Percent Negative Changes	Percent No Change	Percent Positive Changes	Percent Negative Changes	Percent No Change	Percent Positive Changes	Percent Negative Changes	Percent No Change
0 TO 200K	34.03	57.95	8.02	0.01	5.56	94.43	0	6.68	93.32
200K TO 500K	25.8	66.9	7.31	0	18.5	81.5	0	18.42	81.58
500K +	33.53	58.43	8.03	0.02	34.44	65.55	0	39.86	60.14

PERCENT CHANGES BY DIRECTION AND AMOUNT

	MODEL TO NOTICE						NOTICE TO ASSESSOR FINAL						ASSESSOR TO BOR					
	% Positive Changes	% Negative Changes	% No Change	% of Changes Between 0% and 10%	% of Changes Between 10% and 20%	% of Changes Greater Than 20%	% Positive Changes	% Negative Changes	% No Change	% of Changes Between 0% and 10%	% of Changes Between 10% and 20%	% of Changes Greater Than 20%	% Positive Changes	% Negative Changes	% No Change	% of Changes Between 0% and 10%	% of Changes Between 10% and 20%	% of Changes Greater Than 20%
Barrington	66.15	33.85	0	61.02	26.38	12.6	0.02	30	69.98	25.62	3.77	0.63	0	36.92	63.08	23.21	11.28	2.42
Berwyn	0.03	99.97	0	0.18	0.23	99.59	0	7.02	92.98	5.48	1.31	0.23	0	8.42	91.58	4.21	3.78	0.43
Bloom	4.81	95.19	0	10.11	56.1	33.79	0	6.19	93.81	4.04	1.85	0.3	0	5.55	94.45	1.77	3.03	0.75
Bremen	10.1	60.82	29.08	38.36	14.25	18.31	0.15	4.68	95.17	3.47	0.77	0.59	0	9.33	90.67	4.65	3.97	0.7
Calumet	4.44	91.47	4.09	45.5	30.37	20.04	0	8.64	91.36	5.75	2.44	0.44	0	7.24	92.76	3.07	3.75	0.42
Cicero	8.06	42.54	49.4	48	1.11	1.49	0	3.53	96.47	2.61	0.72	0.2	0	9.46	90.54	3.1	5.67	0.69
Elk Grove	59.07	28.79	12.14	66.35	19.15	2.36	0	18.4	81.6	16.82	1.46	0.12	0	23.53	76.47	17.35	5.46	0.72
Evanston	18.75	76.69	4.55	30.91	37.15	27.38	0	23.76	76.24	19.57	3.39	0.79	0	30.39	69.61	19.72	7.26	3.41
Hanover	72.2	20.63	7.17	66.98	21.6	4.24	0	13.98	86.02	12.28	1.6	0.1	0	14.5	85.5	7.56	5.96	0.97
Lemont	39.13	55.45	5.42	58.1	20.46	16.01	0.01	19.41	80.57	16.52	2.59	0.31	0	14.6	85.4	9.72	4.58	0.3
Norwood Park	72.09	22.79	5.12	27.33	29.3	38.25	0	31.91	68.09	28.89	2.78	0.24	0	17.37	82.63	10.54	6.18	0.66
Lyons	15.46	41.5	43.04	45.97	5.32	5.67	0	16.76	83.24	14.08	2.29	0.39	0	16.55	83.45	10.04	5.61	0.9
Maine	38.67	61.33	0.01	84.47	10.02	5.5	0	28.4	71.6	25.77	2.36	0.27	0	25.81	74.19	19.06	5.74	1.01
New Trier	30.03	55.86	14.11	47.05	25.33	13.51	0	33.78	66.22	29.35	3.89	0.53	0	44.6	55.4	31.18	10.32	3.09
Niles	15.43	64.55	20.02	56.85	8.94	14.18	0	21.34	78.66	19.85	1.26	0.23	0	23.07	76.93	18.13	4.3	0.63
Northfield	22.1	66.89	11.01	57.69	20.86	10.44	0	30.63	69.37	27.38	2.77	0.48	0	36.61	63.39	25.67	9.32	1.63
Leyden	75.84	23.25	0.91	86.35	9.93	2.81	0	100	0	94.18	5.6	0.22	0	22.38	77.62	16.72	5.33	0.33
Oak Park	9.28	44.66	46.06	46.79	3.98	3.17	0	22.54	77.46	19.77	2.31	0.46	0	23.35	76.65	17.6	4.65	1.09
Orland	5.46	94.54	0	44.94	36	19.06	0	12.83	87.17	11.84	0.92	0.08	0	15.47	84.53	11.68	3.58	0.21
Palatine	44.03	55.97	0	79.21	14.54	6.25	0	23.13	76.87	20.55	2.4	0.18	0	29.49	70.5	20.11	8.28	1.11
Palos	43.55	44.71	11.74	57.57	26.97	3.71	0	17.12	82.88	14.17	2.4	0.56	0	15.67	84.33	9.22	5.54	0.91
Proviso	50.37	25.65	23.97	63.01	8.07	4.95	0	9.81	90.19	8.32	1.21	0.27	0	10.56	89.44	5.21	4.41	0.95
Rich	48.39	46.59	5.01	28.24	20.95	45.8	0	10.8	89.2	7.72	2.69	0.39	0	10.5	89.5	3.97	5.3	1.23
Riverside	31.36	57.54	11.1	56.43	20.25	12.21	0.15	20.64	79.21	17.27	2.95	0.57	0	32.12	67.88	24.31	5.82	1.99
River Forest	10.59	84.39	5.02	60.99	27.61	6.38	0	11.85	88.15	10.12	1.34	0.39	0	17.66	82.34	13.34	4.01	0.31
Schaumburg	62.98	23.06	13.96	65.09	13.47	7.48	0.01	17.01	82.98	14.8	2.09	0.13	0	20.17	79.83	12.85	6.5	0.82
Stickney	0.14	99.86	0	0.27	0.49	99.24	0	9.42	90.58	7.3	1.84	0.29	0	9.49	90.51	3.79	4.9	0.8

	MODEL TO NOTICE						NOTICE TO ASSESSOR FINAL						ASSESSOR TO BOR					
	% Positive Changes	% Negative Changes	% No Change	% of Changes Between 0% and 10%	% of Changes Between 10% and 20%	% of Changes Greater Than 20%	% Positive Changes	% Negative Changes	% No Change	% of Changes Between 0% and 10%	% of Changes Between 10% and 20%	% of Changes Greater Than 20%	% Positive Changes	% Negative Changes	% No Change	% of Changes Between 0% and 10%	% of Changes Between 10% and 20%	% of Changes Greater Than 20%
Thornton	19.56	80.4	0.03	55.51	24.86	19.6	0	5.72	94.28	3.09	2.21	0.42	0	6.81	93.19	1.71	3.82	1.29
Wheeling	32.37	67.63	0	84.38	12.04	3.58	0	19.81	80.19	17.98	1.63	0.2	0	26.05	73.95	18.67	6.64	0.75
Worth	32.36	35.62	32.01	57.56	2.01	8.42	0	7.97	92.03	6.47	1.33	0.18	0	10.4	89.6	5.36	4.61	0.43
Hyde Park	58.51	41.41	0.09	47.52	24.54	27.86	0	4.55	95.45	3.57	0.62	0.36	0	4.58	95.42	2.77	1.46	0.35
Jefferson	23.75	76.24	0	52.92	29.54	17.54	0	13.68	86.32	12.57	0.84	0.27	0	12.41	87.59	10.11	1.79	0.52
Lake	8.67	91.33	0	30.09	46.91	23	0	4.01	95.99	3.1	0.68	0.23	0	4.95	95.05	2.96	1.76	0.22
North	83.71	16.29	0	22.04	20.58	57.38	0.07	28.57	71.36	23.67	3.79	1.17	0	36.15	63.84	24.42	9.63	2.1
Lakeview	84.67	15.33	0	24.19	15.49	60.32	0.02	35.65	64.33	29.4	3.72	2.56	0	47.42	52.58	31.21	10.59	5.62
Rogers Park	5.68	94.32	0	32.83	38.28	28.89	0	13.69	86.31	12.21	1.24	0.25	0	15.82	84.18	13.23	2.05	0.54
South	75.46	14.96	9.58	44.73	18.82	26.86	0	10.09	89.91	8.57	0.97	0.55	0	13.84	86.16	9.65	3.76	0.43
West Chicago	11.5	88.5	0	17.23	36.33	46.44	0	10.02	89.97	8.08	1.25	0.69	0	11.64	88.36	7.12	3.59	0.93
South Triad	21.9	61.12	16.98	43.92	17.66	21.43	0.02	9.76	90.22	7.76	1.68	0.34	0	11.14	88.86	5.95	4.38	0.8
Chicago	27.21	72.45	0.34	36.78	34.8	28.08	0	9.41	90.59	8	1	0.41	0	10.31	89.69	7.17	2.56	0.58
North Triad	44.43	48.37	7.2	65.23	17.21	10.36	0	25.63	74.37	23.04	2.33	0.26	0	25.81	74.19	17.87	6.78	1.16
County-wide	30.09	62.23	7.68	46.8	24.4	21.12	0.01	13.89	86.1	11.97	1.58	0.35	0	14.76	85.24	9.65	4.3	0.81

MODEL STEP - RATIO ANALYSIS

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Barrington	252	243	10.036	10.377	10.561	Yes	16.2	17.545	19.534	No	1.051	1.071	1.091	No	-0.135	-0.102	-0.069	No	No	Yes
Berwyn	170	164	17.457	18.145	18.801	No	25.134	28.432	32.591	No	1.088	1.11	1.132	No	-0.766	-0.641	-0.516	No	No	No
Bloom	337	332	12.158	12.444	13.258	No	23.014	24.87	26.756	No	1.084	1.101	1.117	No	-0.363	-0.315	-0.267	No	No	No
Bremen	176	171	9.677	9.962	10.151	Yes	11.604	12.768	14.281	Yes	1.008	1.014	1.019	Yes	-0.066	-0.006	0.053	Yes	Yes	Yes
Calumet	31	29	10.5	13.133	18.603	No	63.769	90.656	130.319	No	1.403	1.755	2.103	No	-1.858	-1.409	-0.961	No	No	No
Cicero	118	116	9.962	11.125	12.061	Yes	34.922	40.642	48.832	No	1.153	1.202	1.254	No	-1.062	-0.908	-0.755	No	No	No
Elk Grove	565	544	9.73	9.854	9.984	Yes	11.685	12.352	13.094	Yes	1.017	1.021	1.025	Yes	-0.127	-0.097	-0.067	No	Yes	Yes
Evanston	511	483	9.885	10.158	10.462	Yes	26.087	27.892	29.803	No	1.106	1.128	1.151	No	-0.21	-0.174	-0.137	No	No	Yes
Hanover	1037	1003	10.26	10.375	10.512	No	15.877	16.663	17.494	No	1.037	1.043	1.049	No	-0.16	-0.14	-0.119	No	No	Yes
Lemont	278	262	10.046	10.22	10.339	Yes	12.262	13.281	14.572	Yes	0.978	0.988	0.997	Yes	0.041	0.066	0.092	Yes	Yes	Yes
Norwood Park	694	681	10.12	10.345	10.54	No	24.026	25.469	27.136	No	1.07	1.082	1.094	No	-0.284	-0.245	-0.206	No	No	Yes
Lyons	654	613	9.252	9.466	9.631	No	16.425	17.388	18.397	No	1.055	1.066	1.078	No	-0.106	-0.09	-0.075	No	No	No
Maine	1134	1096	10.172	10.289	10.42	No	15.98	16.684	17.426	No	1.051	1.058	1.065	No	-0.151	-0.135	-0.119	No	No	Yes
New Trier	727	709	9.801	10	10.136	Yes	18.06	18.896	19.937	No	1.073	1.084	1.095	No	-0.138	-0.12	-0.102	No	No	Yes
Niles	1088	1048	10.32	10.413	10.533	No	14.782	15.426	16.087	Yes	1.032	1.037	1.043	No	-0.097	-0.078	-0.059	No	No	Yes
Northfield	968	897	10.082	10.198	10.321	No	15.818	16.529	17.292	No	1.046	1.054	1.061	No	-0.126	-0.108	-0.089	No	No	Yes
Leyden	483	460	9.463	9.578	9.673	No	15.65	16.663	17.802	No	1.051	1.059	1.068	No	-0.286	-0.254	-0.221	No	No	No
Oak Park	448	417	9.285	9.503	9.676	No	17.667	18.959	20.536	No	1.045	1.054	1.062	No	-0.226	-0.187	-0.148	No	No	No
Orland	538	527	11.256	11.425	11.618	No	13.068	13.748	14.555	Yes	1.005	1.012	1.019	Yes	-0.017	0.008	0.033	Yes	Yes	No
Palatine	1049	1018	10.593	10.686	10.827	No	13.799	14.409	15.001	Yes	1.04	1.045	1.05	No	-0.156	-0.14	-0.124	No	No	Yes
Palos	210	204	9.636	9.985	10.168	Yes	13.825	15.02	16.658	Yes	1.008	1.018	1.028	Yes	-0.063	-0.02	0.023	Yes	Yes	Yes
Proviso	850	804	9.544	9.691	9.856	No	17.489	18.418	19.363	No	1.059	1.068	1.076	No	-0.185	-0.164	-0.143	No	No	No
Rich	340	332	10.299	10.64	10.981	No	30.286	32.899	36.093	No	1.072	1.096	1.12	No	-0.082	-0.029	0.024	Yes	Yes	Yes
Riverside	147	141	8.873	9.393	9.961	Yes	20.342	22.752	25.577	No	1.05	1.072	1.094	No	-0.246	-0.179	-0.112	No	No	No
River Forest	181	176	9.989	10.649	11.224	Yes	26.405	29.525	33.499	No	1.124	1.152	1.178	No	-0.486	-0.421	-0.355	No	No	Yes
Schaumburg	1169	1128	9.915	10.025	10.138	Yes	13.211	13.769	14.345	Yes	1.033	1.037	1.041	No	-0.158	-0.142	-0.127	No	No	Yes
Stickney	154	147	15.833	16.33	17.141	No	19.723	22.446	25.28	No	1.068	1.085	1.102	No	-0.559	-0.471	-0.382	No	No	No
Thornton	283	268	9.518	9.804	9.95	No	16.022	17.384	19.241	No	1.017	1.025	1.033	Yes	-0.037	0.025	0.086	Yes	Yes	No

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Wheeling	1498	1441	10.12	10.21	10.339	No	15.06	15.618	16.173	No	1.039	1.043	1.047	No	-0.149	-0.133	-0.117	No	No	Yes
Worth	702	657	9.974	10.157	10.261	Yes	14.888	15.74	16.754	Yes	1.034	1.04	1.046	No	-0.209	-0.18	-0.152	No	No	Yes
Hyde Park	387	369	11.2	11.578	12.063	No	36.277	39.207	42.701	No	1.217	1.278	1.344	No	-0.242	-0.183	-0.124	No	No	No
Jefferson	1867	1764	10.978	11.109	11.212	No	20.12	20.799	21.556	No	1.061	1.066	1.072	No	-0.195	-0.174	-0.154	No	No	No
Lake	1381	1320	12.919	13.2	13.516	No	50.001	52.835	56.036	No	1.305	1.331	1.356	No	-0.865	-0.822	-0.778	No	No	No
North	700	668	6.909	7.07	7.267	No	22.201	23.438	24.669	No	1.012	1.021	1.03	Yes	0.025	0.053	0.081	Yes	Yes	No
Lakeview	285	267	7.185	7.646	8.027	No	26.069	28.445	31.57	No	1.009	1.029	1.049	Yes	0.047	0.085	0.124	Yes	Yes	No
Rogers Park	140	133	10.497	10.981	11.535	No	17.894	20.274	23.309	No	1.043	1.064	1.086	No	-0.285	-0.217	-0.149	No	No	No
South	398	375	9.478	9.686	9.92	No	23.189	25.365	27.721	No	1.119	1.14	1.161	No	-0.372	-0.335	-0.298	No	No	No
West Chicago	703	674	10.255	10.544	10.841	No	31.701	33.708	35.863	No	1.194	1.217	1.24	No	-0.398	-0.366	-0.335	No	No	Yes
Townhouses	2284	2174	10.701	10.828	10.994	No	20.305	21.131	21.924	No	1.112	1.123	1.135	No	-0.174	-0.162	-0.15	No	No	Yes
Single-Fam Detached	18140	17479	10.205	10.237	10.27	No	22.628	23.058	23.495	No	1.122	1.127	1.133	No	-0.169	-0.164	-0.159	No	No	Yes
Multi-Family	1998	1831	11.079	11.241	11.406	No	35.692	37.427	39.275	No	1.27	1.293	1.318	No	-0.457	-0.434	-0.412	No	No	No
Mixed-Use	231	197	10.792	11.634	12.125	No	41.037	46.1	51.835	No	1.323	1.406	1.491	No	-0.481	-0.413	-0.345	No	No	No
South Triad	5617	5360	10.266	10.329	10.398	No	23.847	24.564	25.281	No	1.095	1.102	1.108	No	-0.141	-0.13	-0.12	No	No	Yes
Chicago	5861	5570	10.667	10.768	10.877	No	36.928	38.085	39.283	No	1.312	1.328	1.343	No	-0.369	-0.357	-0.345	No	No	Yes
North Triad	11175	10751	10.194	10.235	10.27	No	16.771	17.016	17.274	No	1.062	1.065	1.069	No	-0.086	-0.081	-0.077	No	No	Yes
County-Wide	22653	21681	10.318	10.351	10.378	No	24.25	24.646	25.063	No	1.139	1.143	1.149	No	-0.185	-0.18	-0.175	No	No	

MODEL STEP - SELECTIVE REAPPRAISAL ANALYSIS

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Barrington	-4.532	-3.944	0.09	6.972	6.805	0.424	No
Berwyn	-1.667	-3.589	0	7.741	8.398	0.24	No
Bloom	-26.225	-24.062	0	11.67	7.694	1	No
Bremen	-6.833	-8.887	0	7.776	4.451	1	No
Calumet	-35.521	-35.916	0.972	6.187	5.911	0.729	No
Cicero	-48.126	-47.567	0.15	3.418	4.007	0.324	No
Elk Grove	2.225	3.07	0.046	10.56	10.613	0.612	No
Evanston	13.798	13.552	0.547	21.473	22.619	0.279	No
Hanover	10.055	10.284	0.802	10.405	10.403	0.44	No
Lemont	-9.533	-9.226	0.88	13.752	13.355	0.792	No
Norwood Park	5.115	6.247	0.069	9.214	9.062	0.431	No
Lyons	-38.715	-34.455	0	15.595	17.91	0	Yes
Maine	12.505	12.928	0.232	10.612	10.389	0.559	No
New Trier	7.644	7.34	0.726	13.526	13.3	0.637	No
Niles	8.332	8.255	0.514	6.316	6.707	0.197	No
Northfield	6.151	5.94	0.224	7.544	7.98	0.019	No
Leyden	20.11	20.625	0.764	4.509	4.462	0.875	No
Oak Park	-10.164	-9.613	0.492	12.637	12.408	0.369	No
Orland	3.444	2.683	0.071	10.907	9.964	0.997	No
Palatine	-5.212	-5.219	0.656	7.272	7.567	0.549	No
Palos	-15.798	-17.718	0.059	11.813	9.288	0.965	No
Proviso	-19.137	-19.345	0.632	9.002	8.896	0.8	No
Rich	-17.876	-15.182	0.009	26.82	28.647	0.144	No
Riverside	-22.227	-23.533	0.254	8.745	7.073	0.916	No
River Forest	-15.655	-15.874	0.7	15.978	16.401	0.551	No
Schaumburg	-1.334	-1.389	0.815	4.151	4.186	0.553	No
Stickney	-3.697	-3.731	0.906	14.458	16.127	0.098	No
Thornton	-7.743	-20.221	0	23.571	20.613	1	Yes

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Wheeling	1.911	1.803	0.147	4.315	4.369	0.666	No
Worth	-9.441	-9.469	0.837	9.346	8.707	0.998	No
Hyde Park	-40.523	-40.57	0.973	12.19	9.473	0.999	No
Jefferson	31.537	28.815	0	24.822	21.157	1	No
Lake	3.981	2.267	0	13.154	11.794	1	No
North	-20.618	-21.282	0.249	22.817	22.378	0.585	No
Lakeview	-14.146	-14.121	0.771	29.186	30.314	0.188	No
Rogers Park	14.689	16.488	0.4	17.861	18.98	0.277	No
South	-16.119	-11.237	0	16.609	15.149	0.844	Yes
West Chicago	-7.975	-3.178	0	16.206	19.81	0	Yes
Townhouses	-0.166	0.902	0.001	23.805	20.787	1	No
Single-Family Detached	-0.962	1.098	0	19.574	15.149	1	No
Multi-Family	-4.346	-1.323	0	30.475	35.98	0	Yes
Mixed-Use	-1.227	1.143	0.181	24.867	22.832	0.69	No
South Triad	-13.1	-14.145	0.002	18.037	15.97	1	No
Chicago	2.975	5.125	0	29.123	28.453	0.975	No
North Triad	4.088	4.217	0.149	10.438	10.613	0.088	No
County-wide	-1.23	0.997	0	21.208	17.167	1	No

NOTICE STEP - RATIO ANALYSIS

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Barrington	252	234	10.403	10.506	10.87	No	10.581	11.906	13.361	Yes	0.996	1.01	1.021	Yes	-0.028	-0.004	0.02	Yes	Yes	Yes
Berwyn	170	161	10.093	10.592	11.083	No	20.776	23.826	27.257	No	1.063	1.079	1.095	No	-0.56	-0.454	-0.348	No	No	Yes
Bloom	337	318	10.362	10.641	11.134	No	18.768	20.507	22.265	No	1.055	1.066	1.078	No	-0.224	-0.183	-0.142	No	No	Yes
Bremen	176	169	9.772	9.899	10.016	Yes	8.688	9.676	10.884	Yes	1.006	1.011	1.015	Yes	-0.078	-0.033	0.013	Yes	Yes	Yes
Calumet	31	27	10.036	11.162	13.279	Yes	33.725	48.701	71.19	No	1.161	1.316	1.464	No	-0.716	-0.456	-0.197	No	No	No
Cicero	118	115	10.029	10.973	12.061	Yes	30.611	35.35	41.6	No	1.114	1.147	1.176	No	-0.719	-0.582	-0.445	No	No	No
Elk Grove	565	528	10.226	10.283	10.323	No	7.344	7.886	8.506	Yes	1.01	1.013	1.015	Yes	-0.103	-0.083	-0.062	No	Yes	Yes
Evanston	511	469	10.005	10.007	10.009	Yes	9.971	11.174	12.577	Yes	1.035	1.043	1.052	No	-0.101	-0.085	-0.068	No	No	Yes
Hanover	1037	981	10.638	10.738	10.864	No	13.591	14.336	15.154	Yes	1.031	1.036	1.041	No	-0.149	-0.131	-0.113	No	No	Yes
Lemont	278	256	9.9	9.927	9.991	Yes	5.544	6.313	7.219	Yes	1.004	1.009	1.014	Yes	-0.046	-0.029	-0.012	Yes	Yes	Yes
Norwood Park	694	649	11.012	11.263	11.494	No	19.147	20.355	21.824	No	1.063	1.071	1.078	No	-0.341	-0.307	-0.273	No	No	No
Lyons	654	610	9.784	9.872	9.95	No	10.263	11.283	12.451	Yes	1.034	1.042	1.05	No	-0.075	-0.063	-0.051	No	No	Yes
Maine	1134	1044	10.125	10.321	10.481	No	9.567	10.047	10.614	Yes	1.023	1.027	1.03	Yes	-0.084	-0.074	-0.064	No	Yes	Yes
New Trier	727	679	10.006	10.008	10.009	Yes	6.302	6.946	7.678	Yes	1.011	1.014	1.018	Yes	-0.023	-0.015	-0.006	Yes	Yes	Yes
Niles	1088	978	10.024	10.036	10.139	Yes	11.605	12.324	13.008	Yes	1.013	1.018	1.022	Yes	-0.027	-0.01	0.007	Yes	Yes	Yes
Northfield	968	893	10.01	10.011	10.014	Yes	5.874	6.378	6.939	Yes	1.012	1.014	1.016	Yes	-0.04	-0.032	-0.023	Yes	Yes	Yes
Leyden	483	451	10.029	10.034	10.096	Yes	8.861	9.873	10.987	Yes	1.028	1.033	1.038	Yes	-0.19	-0.169	-0.149	No	Yes	Yes
Oak Park	448	420	9.769	9.822	9.893	No	10.533	11.745	13.142	Yes	1.03	1.036	1.043	Yes	-0.179	-0.152	-0.125	No	Yes	Yes
Orland	538	513	10.016	10.026	10.032	Yes	6.208	6.662	7.178	Yes	1.006	1.008	1.011	Yes	-0.046	-0.033	-0.019	Yes	Yes	Yes
Palatine	1049	965	10.428	10.437	10.459	No	7.081	7.578	8.115	Yes	1.008	1.011	1.014	Yes	-0.037	-0.027	-0.017	Yes	Yes	Yes
Palos	210	197	9.913	10.001	10.063	Yes	7.515	8.387	9.472	Yes	1.013	1.018	1.023	Yes	-0.092	-0.066	-0.041	Yes	Yes	Yes
Proviso	850	777	10.265	10.477	10.545	No	11.739	12.395	13.265	Yes	1.038	1.044	1.049	No	-0.144	-0.129	-0.115	No	No	Yes
Rich	340	319	10.264	10.513	10.685	No	15.365	16.893	18.797	No	1.056	1.067	1.078	No	-0.188	-0.161	-0.134	No	No	Yes
Riverside	147	131	9.558	9.776	9.92	No	6.83	7.788	9.078	Yes	1.008	1.015	1.022	Yes	-0.05	-0.029	-0.008	Yes	Yes	Yes
River Forest	181	173	9.612	9.866	10.158	Yes	19.625	22.096	25.19	No	1.078	1.097	1.115	No	-0.279	-0.229	-0.178	No	No	Yes
Schaumburg	1169	1107	10.23	10.365	10.422	No	9.666	10.117	10.666	Yes	1.022	1.025	1.028	Yes	-0.117	-0.105	-0.093	No	Yes	Yes
Stickney	154	138	10.081	10.298	10.659	No	14.358	17.095	20.348	Yes	1.039	1.055	1.072	No	-0.342	-0.266	-0.191	No	No	Yes
Thornton	283	258	10.064	10.33	10.427	No	9.305	10.087	11.157	Yes	1.013	1.017	1.022	Yes	-0.091	-0.059	-0.026	Yes	Yes	Yes

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Wheeling	1498	1406	10.028	10.033	10.047	Yes	7.86	8.374	8.926	Yes	1.018	1.02	1.022	Yes	-0.086	-0.076	-0.066	No	Yes	Yes
Worth	702	642	10.072	10.206	10.358	No	12.913	13.807	14.796	Yes	1.03	1.035	1.04	Yes	-0.189	-0.164	-0.139	No	Yes	Yes
Hyde Park	387	371	11.612	12.156	12.692	No	28.043	30.618	33.364	No	1.161	1.192	1.221	No	-0.181	-0.144	-0.107	No	No	No
Jefferson	1867	1743	10.159	10.288	10.331	No	13.777	14.295	14.945	Yes	1.039	1.042	1.045	No	-0.168	-0.154	-0.14	No	No	Yes
Lake	1381	1303	11.243	11.409	11.635	No	41.509	44.216	47.024	No	1.23	1.251	1.27	No	-0.689	-0.652	-0.615	No	No	No
North	700	641	10.001	10.002	10.004	Yes	7.265	8.076	9.005	Yes	1.015	1.019	1.023	Yes	-0.059	-0.044	-0.029	Yes	Yes	Yes
Lakeview	285	261	10.002	10.004	10.008	Yes	8.221	9.607	11.311	Yes	0.976	0.992	1.007	Yes	0.002	0.02	0.038	Yes	Yes	Yes
Rogers Park	140	129	9.612	9.766	9.996	Yes	12.567	15.288	18.729	Yes	1.036	1.055	1.075	No	-0.296	-0.238	-0.18	No	No	Yes
South	398	372	10.522	10.634	10.863	No	18.09	20.44	22.959	No	1.086	1.102	1.119	No	-0.299	-0.266	-0.232	No	No	Yes
West Chicago	703	638	10.007	10.01	10.013	Yes	9.916	10.828	11.862	Yes	1.044	1.05	1.057	No	-0.116	-0.105	-0.094	No	No	Yes
Townhouses	2284	2160	10.129	10.207	10.288	No	11.153	11.655	12.19	Yes	1.043	1.048	1.052	No	-0.099	-0.093	-0.086	No	No	Yes
Single-Fam Detached	18140	16946	10.179	10.207	10.24	No	14.116	14.437	14.763	Yes	1.054	1.057	1.061	No	-0.108	-0.104	-0.101	No	No	Yes
Multi-Family	1998	1779	10.49	10.636	10.782	No	21.775	23.119	24.547	No	1.119	1.131	1.144	No	-0.269	-0.254	-0.239	No	No	Yes
Mixed-Use	231	181	10.247	10.885	11.437	No	23.799	27.63	32.703	No	1.139	1.181	1.223	No	-0.282	-0.235	-0.188	No	No	No
South Triad	5617	5224	10.031	10.038	10.052	Yes	13.434	13.875	14.327	Yes	1.051	1.054	1.058	No	-0.105	-0.099	-0.094	No	No	Yes
Chicago	5861	5458	10.305	10.366	10.415	No	23.012	23.945	24.949	No	1.13	1.14	1.15	No	-0.22	-0.212	-0.203	No	No	Yes
North Triad	11175	10384	10.28	10.312	10.345	No	10.608	10.824	11.046	Yes	1.031	1.033	1.035	No	-0.063	-0.06	-0.057	No	No	Yes
County-Wide	22653	21066	10.215	10.245	10.271	No	14.774	15.067	15.377	Yes	1.061	1.063	1.066	No	-0.115	-0.112	-0.108	No	No	

NOTICE STEP- SELECTIVE REAPPRAISAL ANALYSIS

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Barrington	10.188	11.191	0.008	7.772	9.814	0	No
Berwyn	-13.526	-13.26	0.482	4.944	5.848	0.002	No
Bloom	-8.85	-7.429	0.002	6.815	6.395	0.806	No
Bremen	-11.032	-10.777	0.631	5.393	5.87	0.302	No
Calumet	-10.888	-13.331	0.537	6.552	6.326	0.755	No
Cicero	-13.387	-13.324	0.316	5.22	6.668	0	No
Elk Grove	11.441	13.231	0	4.118	6.051	0	No
Evanston	18.243	25.192	0	13.055	19.73	0	Yes
Hanover	10.998	11.624	0	5.248	5.631	0.044	No
Lemont	-8.986	-7.784	0	4.465	6.277	0	No
Norwood Park	9.833	10.459	0	4.059	5.12	0	No
Lyons	-8.855	-1.182	0	8.988	15.051	0	Yes
Maine	12.865	15.893	0	6.741	9.859	0	Yes
New Trier	17.324	22.925	0	9.847	14.472	0	Yes
Niles	15.323	16.939	0	5.176	7.439	0	No
Northfield	16.889	21.463	0	7.654	12.31	0	Yes
Leyden	13.716	16.605	0	4.378	7.26	0	No
Oak Park	-4.339	-0.408	0	5.948	12.048	0	Yes
Orland	-8.629	-7.214	0	4.619	6.446	0	No
Palatine	12.487	14.979	0	6.719	8.977	0	No
Palos	-7.115	-5.695	0	5.591	7.322	0	No
Proviso	-12.158	-7.638	0	6.192	10.386	0	Yes
Rich	-10.834	-9.536	0.001	5.571	7.653	0	No
Riverside	-9.873	-6.485	0	8.444	12.775	0	Yes
River Forest	-10.45	-10.019	0.131	7.386	7.134	0.905	No
Schaumburg	12.8	13.878	0	4.248	6.245	0	No
Stickney	-14.885	-13.485	0.001	4.569	6.414	0	No
Thornton	-9.787	-6.024	0	4.471	9.351	0	Yes

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Wheeling	14.142	16.608	0	4.729	8.227	0	Yes
Worth	-13.394	-12.714	0	4.453	5.431	0	No
Hyde Park	10.162	12.443	0	7.958	12.494	0	Yes
Jefferson	6.49	9.05	0	7.679	10.476	0	No
Lake	8.064	10.051	0	6.481	8.858	0	No
North	13.54	20.468	0	5.901	16.069	0	Yes
Lakeview	20.777	29.051	0	14.204	18.957	0	Yes
Rogers Park	9.205	12.847	0	8.604	11.23	0	Yes
South	10.965	14.765	0	8.448	10.308	0	Yes
West Chicago	10.216	24.458	0	9.766	21.331	0	Yes
Townhouses	7.759	11.015	0	13.617	13.215	0.651	Yes
Single-Fam Detached	4.824	11.873	0	14.696	14.273	0	Yes
Multi-Family	9.616	12.725	0	10.636	14.969	0	Yes
Mixed-Use	9.599	16.565	0	13.349	19.772	0	Yes
South Triad	-10.588	-7.974	0	6.089	9.074	0	No
Chicago	8.735	13.084	0	7.893	13.217	0	Yes
North Triad	13.177	15.39	0	6.272	9.058	0	No
County-Wide	5.925	11.894	0	13.877	14.177	0	Yes

MODEL STEP TO NOTICE STEP - SELECTIVE REAPPRAISAL ANALYSIS

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Barrington	3.162	5.426	0.157	7.286	10.642	0	Yes
Berwyn	-41.054	-39.476	0	2.343	3.902	0.088	No
Bloom	-13.611	-10.942	0	6.604	5.291	1	No
Bremen	-0.005	-0.003	0	0.007	0.004	1	No
Calumet	-5.009	-5.009	0.873	10.371	10.37	0.302	No
Cicero	-0.004	-0.001	0	0.004	0.008	0	Yes
Elk Grove	4.996	6.09	0	7.409	6.108	0.001	No
Evanston	-10.001	-2	0	11.86	19.251	0	Yes
Hanover	4.996	6.994	0	7.409	7.413	0.109	No
Lemont	-1.672	-0.002	0.1	9.89	14.826	0	Yes
Norwood Park	11.238	14.515	0	15.805	12.159	0.602	Yes
Lyons	-0.001	3.27	0	0.002	4.857	0	Yes
Maine	-2.264	1.205	0	7.238	10.511	0	Yes
New Trier	-0.001	1.624	0	10.379	14.575	0	Yes
Niles	-0.003	-0.002	0	4.444	7.576	0	Yes
Northfield	-3	0	0	4.448	11.666	0	Yes
Leyden	4.998	7.135	0	3.492	6.105	0	No
Oak Park	-0.001	0	0	0.001	0.864	0	Yes
Orland	-11.131	-8.522	0.001	6.458	9.477	0	Yes
Palatine	-1.722	1.169	0	7.141	7.145	0	No
Palos	-0.001	3.206	0.004	7.418	10.382	0	Yes
Proviso	0.001	7.995	0	7.401	11.855	0	Yes
Rich	-0.001	2.183	0.827	29.285	32.52	0.055	No
Riverside	-0.002	-0.001	0	7.412	11.161	0.002	Yes
River Forest	-5.355	-8.001	0.91	7.932	6.969	0.1	No
Schaumburg	1.999	4.996	0	2.968	7.41	0	Yes
Stickney	-35.431	-35.428	0.004	2.783	4.519	0	No
Thornton	-7.178	2.065	0	10.129	13.535	0	Yes
Wheeling	-2.345	0.584	0	4.344	8.61	0	Yes

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Worth	-0.001	-0.001	0	0.006	1.694	0	No
Hyde Park	1.106	8.263	0	15.414	16.462	0.381	Yes
Jefferson	-7.221	-5.385	0	8.874	10.684	0	No
Lake	-12.458	-12.455	0	8.445	10.384	0	No
North	23.056	37.684	0	29.297	34.316	0.004	Yes
Lakeview	26.914	42.381	0	35.91	46.426	0	Yes
Rogers Park	-12.933	-10.66	0.002	9.847	11.231	0.032	No
South	7.997	11.3	0	11.857	16.429	0	Yes
West Chicago	-19.752	-6.239	0	12.793	22.405	0	Yes
South Triad	-0.006	-0.001	0	8.719	12.627	0	Yes
Chicago	-10.149	-1.396	0	14.238	18.337	0	Yes
North Triad	-0.001	3	0	7.412	9.86	0	Yes
County-Wide	-2.946	1.119	0	12.316	13.241	0	Yes

ASSESSOR FINAL STEP - RATIO ANALYSIS

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Barrington	252	233	10.212	10.356	10.504	No	9.782	11.085	12.654	Yes	0.998	1.01	1.021	Yes	-0.027	-0.005	0.018	Yes	Yes	Yes
Berwyn	170	159	10	10.305	10.716	Yes	21.234	24.311	28.259	No	1.063	1.079	1.094	No	-0.575	-0.463	-0.35	No	No	Yes
Bloom	337	316	10.101	10.47	10.926	No	18.185	19.642	21.288	No	1.051	1.062	1.073	No	-0.21	-0.171	-0.132	No	No	Yes
Bremen	176	162	9.731	9.867	10	Yes	7.145	7.966	8.99	Yes	1.004	1.008	1.011	Yes	-0.064	-0.025	0.013	Yes	Yes	Yes
Calumet	31	27	10	11.162	13.279	Yes	33.81	48.715	72.078	No	1.164	1.32	1.477	No	-0.717	-0.457	-0.198	No	No	No
Cicero	118	115	10.029	10.973	12.061	Yes	30.459	35.19	41.429	No	1.114	1.146	1.177	No	-0.719	-0.583	-0.446	No	No	No
Elk Grove	565	527	10.044	10.163	10.264	Yes	7.02	7.566	8.19	Yes	1.01	1.012	1.014	Yes	-0.1	-0.08	-0.06	No	Yes	Yes
Evanston	511	459	10.002	10.004	10.006	Yes	8.641	9.741	11.03	Yes	1.03	1.038	1.045	Yes	-0.089	-0.074	-0.058	No	Yes	Yes
Hanover	1037	981	10.559	10.644	10.739	No	13.384	14.171	15.006	Yes	1.033	1.038	1.042	No	-0.158	-0.139	-0.121	No	No	No
Lemont	278	252	9.9	9.932	9.986	Yes	4.788	5.517	6.393	Yes	1.004	1.009	1.014	Yes	-0.046	-0.03	-0.015	Yes	Yes	Yes
Norwood Park	694	644	10.727	10.976	11.234	No	18.87	20.201	21.678	No	1.062	1.07	1.078	No	-0.325	-0.291	-0.257	No	No	No
Lyons	654	605	9.768	9.842	9.947	No	9.477	10.465	11.56	Yes	1.032	1.04	1.048	No	-0.072	-0.06	-0.049	Yes	Yes	Yes
Maine	1134	1035	10.03	10.046	10.143	Yes	9.24	9.835	10.413	Yes	1.027	1.031	1.034	Yes	-0.096	-0.086	-0.076	No	Yes	Yes
New Trier	727	653	10.004	10.005	10.006	Yes	5.032	5.612	6.278	Yes	1.01	1.013	1.017	Yes	-0.025	-0.017	-0.009	Yes	Yes	Yes
Niles	1088	978	10.01	10.015	10.02	Yes	10.762	11.452	12.211	Yes	1.013	1.018	1.022	Yes	-0.027	-0.01	0.007	Yes	Yes	Yes
Northfield	968	870	10.004	10.005	10.007	Yes	4.665	5.104	5.597	Yes	1.011	1.013	1.015	Yes	-0.041	-0.033	-0.025	Yes	Yes	Yes
Leyden	483	448	9.626	9.629	9.633	No	8.217	9.162	10.26	Yes	1.027	1.032	1.036	Yes	-0.18	-0.16	-0.141	No	Yes	Yes
Oak Park	448	413	9.735	9.788	9.83	No	9.638	10.818	12.214	Yes	1.027	1.034	1.04	Yes	-0.167	-0.14	-0.114	No	Yes	Yes
Orland	538	505	10	10.008	10.015	Yes	5.323	5.726	6.184	Yes	1.006	1.007	1.009	Yes	-0.04	-0.028	-0.016	Yes	Yes	Yes
Palatine	1049	977	10.412	10.416	10.422	No	7.282	7.731	8.223	Yes	1.009	1.012	1.015	Yes	-0.039	-0.029	-0.019	Yes	Yes	Yes
Palos	210	196	9.837	9.994	10.006	Yes	6.547	7.279	8.234	Yes	1.011	1.016	1.02	Yes	-0.085	-0.063	-0.041	Yes	Yes	Yes
Proviso	850	774	10.051	10.218	10.402	No	11.441	12.218	13.095	Yes	1.037	1.042	1.047	No	-0.141	-0.126	-0.111	No	No	Yes
Rich	340	319	10.098	10.264	10.528	No	15.043	16.716	18.597	No	1.054	1.065	1.076	No	-0.184	-0.157	-0.129	No	No	Yes
Riverside	147	131	9.517	9.739	9.893	No	6.146	7.086	8.338	Yes	1.007	1.014	1.02	Yes	-0.045	-0.025	-0.005	Yes	Yes	Yes
River Forest	181	173	9.623	9.953	10.091	Yes	19.052	21.114	24.163	No	1.076	1.094	1.112	No	-0.271	-0.224	-0.177	No	No	Yes
Schaumburg	1169	1104	10.034	10.06	10.164	Yes	9.416	9.996	10.556	Yes	1.023	1.025	1.028	Yes	-0.122	-0.109	-0.097	No	Yes	Yes
Stickney	154	138	9.96	10.158	10.313	Yes	14.216	17.032	20.774	Yes	1.038	1.054	1.071	No	-0.332	-0.254	-0.176	No	No	Yes
Thornton	283	257	10	10.032	10.194	Yes	8.739	9.604	10.511	Yes	1.011	1.015	1.019	Yes	-0.08	-0.049	-0.017	Yes	Yes	Yes

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Wheeling	1498	1387	10.02	10.023	10.026	Yes	7.156	7.64	8.169	Yes	1.017	1.019	1.021	Yes	-0.084	-0.075	-0.065	No	Yes	Yes
Worth	702	640	10	10.045	10.144	Yes	12.2	13.16	14.176	Yes	1.029	1.034	1.039	Yes	-0.192	-0.168	-0.143	No	Yes	Yes
Hyde Park	387	369	11.245	11.851	12.509	No	27.832	30.123	32.808	No	1.157	1.186	1.211	No	-0.18	-0.143	-0.107	No	No	No
Jefferson	1867	1725	10.018	10.035	10.117	Yes	13.302	13.94	14.545	Yes	1.038	1.041	1.044	No	-0.166	-0.152	-0.138	No	No	Yes
Lake	1381	1303	11.181	11.32	11.553	No	40.669	43.272	45.9	No	1.226	1.246	1.266	No	-0.666	-0.63	-0.595	No	No	No
North	700	630	9.949	10	10	Yes	7.456	8.25	9.2	Yes	1.012	1.018	1.026	Yes	-0.039	-0.023	-0.008	Yes	Yes	Yes
Lakeview	285	255	9.997	10	10.003	Yes	7.989	9.268	10.837	Yes	0.993	1.005	1.017	Yes	-0.018	0.001	0.02	Yes	Yes	Yes
Rogers Park	140	128	9.621	9.771	9.996	Yes	11.67	14.437	17.953	Yes	1.036	1.056	1.078	No	-0.303	-0.246	-0.189	No	No	Yes
South	398	370	10.435	10.582	10.741	No	18.148	20.225	22.594	No	1.083	1.099	1.115	No	-0.282	-0.249	-0.215	No	No	No
West Chicago	703	631	10.005	10.008	10.011	Yes	9.454	10.319	11.298	Yes	1.04	1.046	1.053	No	-0.108	-0.097	-0.085	No	No	Yes
Townhouses	2284	2159	10.056	10.112	10.192	No	10.984	11.502	12.04	Yes	1.045	1.049	1.054	No	-0.103	-0.096	-0.089	No	No	Yes
Single-Fam Detached	18140	16804	10.023	10.025	10.029	Yes	13.485	13.821	14.165	Yes	1.057	1.06	1.063	No	-0.111	-0.107	-0.104	No	No	Yes
Multi-Family	1998	1753	10.218	10.315	10.416	No	21.907	23.322	24.84	No	1.12	1.132	1.146	No	-0.271	-0.256	-0.24	No	No	Yes
Mixed-Use	231	173	10.018	10.35	11.036	Yes	23.688	28.361	33.724	No	1.136	1.182	1.232	No	-0.261	-0.211	-0.16	No	No	Yes
South Triad	5617	5182	10.006	10.01	10.016	Yes	12.604	13.038	13.492	Yes	1.05	1.053	1.057	No	-0.102	-0.097	-0.091	No	No	Yes
Chicago	5861	5411	10.082	10.134	10.186	No	22.825	23.761	24.749	No	1.138	1.148	1.157	No	-0.227	-0.218	-0.209	No	No	Yes
North Triad	11175	10296	10.032	10.038	10.05	Yes	10.159	10.395	10.632	Yes	1.031	1.033	1.034	No	-0.065	-0.062	-0.059	No	No	Yes
County-Wide	22653	20889	10.029	10.033	10.038	Yes	14.268	14.578	14.897	Yes	1.063	1.066	1.068	No	-0.119	-0.115	-0.112	No	No	

ASSESSOR FINAL STEP - SELECTIVE REAPPRAISAL ANALYSIS

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Barrington	9.091	11.025	0.006	7.919	11.576	0	Yes
Berwyn	-13.594	-13.531	0.909	5.184	6.587	0	No
Bloom	-9.014	-8.461	0.107	7.005	6.666	0.41	No
Bremen	-11.001	-10.811	0.851	5.558	6.18	0.089	No
Calumet	-11.293	-13.356	0.337	6.94	6.48	0.655	No
Cicero	-13.325	-12.667	0.27	5.402	7.292	0	No
Elk Grove	11.045	13.027	0	4.769	7.424	0	No
Evanston	17.576	24.495	0	13.116	20.082	0	Yes
Hanover	10.686	11.415	0.001	5.837	6.386	0.014	No
Lemont	-9.296	-7.606	0	5.103	6.478	0	No
Norwood Park	9.578	10.493	0	5.494	7.506	0	No
Lyons	-9.05	-1.011	0	9.236	17.196	0	Yes
Maine	12.182	15.151	0	7.391	10.137	0	No
New Trier	16.083	22.837	0	10.158	16.444	0	Yes
Niles	14.734	16.278	0	5.764	8.328	0	No
Northfield	15.984	20.93	0	8.544	14.551	0	Yes
Leyden	8.656	11.917	0	4.872	7.746	0	Yes
Oak Park	-4.574	-0.432	0	6.562	12.721	0	Yes
Orland	-8.64	-7.194	0	4.956	7.114	0	No
Palatine	11.958	14.077	0	7.3	9.17	0	No
Palos	-7.372	-6.151	0.004	6.098	9.134	0	Yes
Proviso	-12.339	-8.057	0	6.394	10.852	0	Yes
Rich	-11.078	-10.29	0.017	5.952	8.747	0	No
Riverside	-9.585	-6.142	0	8.274	12.984	0	Yes
River Forest	-10.239	-9.71	0.037	7.477	7.502	0.684	No
Schaumburg	12.411	13.645	0	4.954	7.219	0	No
Stickney	-15.177	-13.633	0.005	4.858	6.899	0	No
Thornton	-9.957	-6.029	0	4.778	10.144	0	Yes

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Wheeling	13.652	16.107	0	5.364	9.582	0	Yes
Worth	-13.414	-12.939	0.006	4.795	6.313	0	No
Hyde Park	10.036	11.535	0.015	8.104	12.509	0	Yes
Jefferson	6.254	8.503	0	7.898	10.81	0	No
Lake	7.932	9.741	0	6.576	9.078	0	No
North	13.083	20.341	0	7.053	19.153	0	Yes
Lakeview	21.071	26.596	0	14.437	21.546	0	Yes
Rogers Park	9.095	13.116	0	8.718	11.652	0	Yes
South	10.703	14.613	0	8.531	11.708	0	Yes
West Chicago	9.963	24.298	0	9.96	21.4	0	Yes
Townhouses	7.98	11.247	0	13.703	13.405	0.347	Yes
Single-Fam Detached	4.229	10.888	0	14.564	15.066	0	Yes
Multi-Family	9.239	12.018	0	11.022	16.263	0	Yes
Mixed-Use	8.88	13.644	0	13.922	23.87	0	Yes
South Triad	-10.729	-8.237	0	6.33	9.786	0	Yes
Chicago	8.519	12.554	0	8.038	13.857	0	Yes
North Triad	12.464	14.686	0	6.882	9.993	0	Yes
County-Wide	5.383	11.047	0	13.933	15.012	0	Yes

BOARD OF REVIEW STEP - RATIO ANALYSIS

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Barrington	252	227	10	10.009	10.022	Yes	8.207	9.511	11.114	Yes	1.011	1.02	1.029	Yes	-0.049	-0.027	-0.005	Yes	Yes	Yes
Berwyn	170	159	10	10.253	10.626	Yes	21.048	24.277	28.14	No	1.064	1.08	1.095	No	-0.577	-0.463	-0.35	No	No	Yes
Bloom	337	318	10	10.172	10.504	Yes	17.983	19.802	21.714	No	1.053	1.064	1.075	No	-0.209	-0.17	-0.13	No	No	Yes
Bremen	176	160	9.649	9.847	9.962	Yes	7.286	8.07	9.124	Yes	1.001	1.005	1.009	Yes	-0.035	0.002	0.04	Yes	Yes	Yes
Calumet	31	27	9.767	11.162	13.279	Yes	34.446	49.228	72.247	No	1.168	1.322	1.478	No	-0.719	-0.457	-0.196	No	No	No
Cicero	118	115	10	10.861	11.902	Yes	30.498	35.017	42.194	No	1.115	1.148	1.181	No	-0.723	-0.584	-0.445	No	No	No
Elk Grove	565	517	10.009	10.02	10.036	Yes	7.672	8.238	8.876	Yes	1.011	1.014	1.017	Yes	-0.109	-0.087	-0.064	No	Yes	Yes
Evanston	511	459	9.752	9.849	9.927	No	11.994	13.109	14.385	Yes	1.043	1.054	1.065	No	-0.109	-0.091	-0.072	No	No	Yes
Hanover	1037	977	10.371	10.497	10.599	No	13.462	14.194	15.015	Yes	1.034	1.039	1.044	No	-0.159	-0.14	-0.122	No	No	Yes
Lemont	278	250	9.853	9.911	9.951	Yes	4.624	5.187	5.874	Yes	1.009	1.012	1.016	Yes	-0.058	-0.045	-0.031	Yes	Yes	Yes
Norwood Park	694	644	10.579	10.694	10.974	No	19.673	21.05	22.434	No	1.065	1.074	1.083	No	-0.337	-0.301	-0.265	No	No	No
Lyons	654	588	9.7	9.78	9.866	No	9.901	10.852	11.942	Yes	1.036	1.045	1.055	No	-0.074	-0.062	-0.05	Yes	Yes	Yes
Maine	1134	1020	10.009	10.015	10.02	Yes	10.282	10.859	11.49	Yes	1.034	1.039	1.043	No	-0.117	-0.106	-0.094	No	No	Yes
New Trier	727	653	9.902	9.968	9.998	Yes	8.259	8.862	9.563	Yes	1.019	1.025	1.032	Yes	-0.044	-0.035	-0.025	Yes	Yes	Yes
Niles	1088	978	10	10	10	Yes	11.781	12.457	13.199	Yes	1.018	1.023	1.029	Yes	-0.035	-0.017	0.001	Yes	Yes	Yes
Northfield	968	870	9.881	9.981	10	Yes	8.588	9.073	9.68	Yes	1.019	1.022	1.026	Yes	-0.061	-0.05	-0.039	Yes	Yes	Yes
Leyden	483	443	9.615	9.623	9.631	No	9.854	10.815	11.924	Yes	1.035	1.041	1.048	No	-0.224	-0.202	-0.179	No	No	Yes
Oak Park	448	402	9.598	9.702	9.796	No	10.274	11.404	12.73	Yes	1.028	1.035	1.042	Yes	-0.166	-0.139	-0.111	No	Yes	Yes
Orland	538	498	9.998	10	10.001	Yes	5.458	5.838	6.27	Yes	1.006	1.008	1.011	Yes	-0.045	-0.033	-0.02	Yes	Yes	Yes
Palatine	1049	953	10.201	10.311	10.397	No	7.692	8.11	8.578	Yes	1.011	1.014	1.017	Yes	-0.047	-0.036	-0.026	Yes	Yes	Yes
Palos	210	193	9.667	9.913	10	Yes	6.576	7.268	8.227	Yes	1.009	1.013	1.017	Yes	-0.07	-0.048	-0.026	Yes	Yes	Yes
Proviso	850	764	10.023	10.037	10.11	Yes	11.066	11.814	12.61	Yes	1.035	1.04	1.045	No	-0.128	-0.113	-0.098	No	No	Yes
Rich	340	316	10.034	10.066	10.196	Yes	13.606	15.357	17.336	Yes	1.047	1.058	1.069	No	-0.158	-0.131	-0.103	No	No	Yes
Riverside	147	138	9.241	9.432	9.718	No	9.9	11.182	12.794	Yes	1.021	1.033	1.045	Yes	-0.093	-0.065	-0.037	Yes	Yes	No
River Forest	181	173	9.611	9.866	10	Yes	18.188	20.197	22.967	No	1.073	1.091	1.108	No	-0.254	-0.209	-0.164	No	No	Yes
Schaumburg	1169	1091	10.018	10.023	10.032	Yes	9.822	10.374	10.972	Yes	1.026	1.029	1.032	Yes	-0.135	-0.122	-0.109	No	Yes	Yes
Stickney	154	138	9.89	10	10.251	Yes	13.972	17.021	20.621	Yes	1.034	1.05	1.067	No	-0.283	-0.202	-0.122	No	No	Yes
Thornton	283	262	9.947	10	10.031	Yes	10.517	11.469	12.629	Yes	1.012	1.017	1.022	Yes	-0.071	-0.033	0.006	Yes	Yes	Yes

Stratum	Sale Count	Sale Count Trim	Median LCL	Median	Median UCL	Median Std. Met	COD LCL	COD	COD UCL	COD Std. Met	PRD LCL	PRD	PRD UCL	PRD Std. Met	PRB LCL	PRB	PRB UCL	PRB Std. Met	Vertical Inequity Std. Met	Median w/ in 5% of County
Wheeling	1498	1348	10.008	10.011	10.014	Yes	8.488	8.954	9.458	Yes	1.021	1.024	1.026	Yes	-0.096	-0.085	-0.074	No	Yes	Yes
Worth	702	636	10	10	10	Yes	10.833	11.694	12.664	Yes	1.026	1.031	1.037	Yes	-0.173	-0.15	-0.128	No	Yes	Yes
Hyde Park	387	366	11.208	11.764	12.365	No	28.098	30.223	32.893	No	1.167	1.203	1.239	No	-0.203	-0.166	-0.128	No	No	No
Jefferson	1867	1709	10.005	10.012	10.023	Yes	13.702	14.328	14.994	Yes	1.041	1.044	1.048	No	-0.179	-0.164	-0.149	No	No	Yes
Lake	1381	1303	11.05	11.184	11.321	No	41.26	43.868	46.728	No	1.234	1.254	1.274	No	-0.685	-0.649	-0.613	No	No	No
North	700	630	9.435	9.517	9.592	No	11.838	12.725	13.723	Yes	1.02	1.026	1.033	Yes	-0.046	-0.027	-0.007	Yes	Yes	Yes
Lakeview	285	255	9.768	9.891	9.969	Yes	9.493	10.7	12.209	Yes	1.006	1.019	1.03	Yes	-0.034	-0.016	0.003	Yes	Yes	Yes
Rogers Park	140	127	9.483	9.65	9.903	No	12.769	15.601	19.203	Yes	1.04	1.06	1.083	No	-0.317	-0.257	-0.197	No	No	Yes
South	398	368	10.188	10.517	10.684	No	18.825	20.824	23.451	No	1.086	1.103	1.12	No	-0.296	-0.261	-0.227	No	No	No
West Chicago	703	631	9.776	9.959	10	Yes	13.239	14.122	15.256	Yes	1.059	1.07	1.081	No	-0.132	-0.118	-0.104	No	No	Yes
Townhouses	2284	2151	10.015	10.02	10.027	Yes	11.135	11.656	12.211	Yes	1.053	1.058	1.063	No	-0.113	-0.107	-0.1	No	No	Yes
Single-Fam Detached	18140	16629	10.001	10.002	10.004	Yes	14.322	14.654	14.996	Yes	1.076	1.079	1.083	No	-0.128	-0.124	-0.121	No	No	Yes
Multi-Family	1998	1753	10.021	10.071	10.174	Yes	23.649	25.164	26.694	No	1.147	1.162	1.177	No	-0.309	-0.292	-0.276	No	No	Yes
Mixed-Use	231	173	10.001	10.013	10.227	Yes	23.382	28.328	34.033	No	1.143	1.194	1.247	No	-0.268	-0.215	-0.162	No	No	Yes
South Triad	5617	5137	10	10	10	Yes	12.429	12.85	13.29	Yes	1.053	1.057	1.061	No	-0.102	-0.096	-0.09	No	No	Yes
Chicago	5861	5389	10.014	10.021	10.035	Yes	24.156	25.14	26.153	No	1.168	1.178	1.189	No	-0.251	-0.242	-0.233	No	No	Yes
North Triad	11175	10180	10.005	10.007	10.009	Yes	11.201	11.43	11.667	Yes	1.047	1.05	1.052	No	-0.088	-0.084	-0.081	No	No	Yes
County-Wide	22653	20706	10.004	10.006	10.008	Yes	15.051	15.361	15.678	No	1.082	1.085	1.088	No	-0.136	-0.133	-0.129	No	No	

BOARD OF REVIEW STEP - SELECTIVE REAPPRAISAL ANALYSIS

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Barrington	8.105	9.469	0.495	7.855	12.369	0	Yes
Berwyn	-13.416	-13.984	0.604	5.863	6.804	0.003	No
Bloom	-9.023	-8.87	0.877	7.35	7.834	0.029	No
Bremen	-10.995	-11.05	0.583	6.17	6.409	0.317	No
Calumet	-10.693	-13.356	0.268	7.604	7.524	0.478	No
Cicero	-13.052	-14.031	0.788	6.352	9.113	0.026	No
Elk Grove	10.758	11.063	0.274	5.776	8.537	0	No
Evanston	16.566	20.311	0	13.671	18.405	0	Yes
Hanover	10.546	10.777	0.623	6.506	7.171	0.003	No
Lemont	-9.115	-7.548	0	5.811	7.933	0	No
Norwood Park	9.332	9.824	0.002	6.701	9.317	0	No
Lyons	-8.811	-1.456	0	10.089	15.741	0	Yes
Maine	11.639	12.685	0	8.223	11.412	0	Yes
New Trier	14.741	17.284	0	11.119	16.219	0	Yes
Niles	14.572	14.988	0	6.572	9.388	0	No
Northfield	15.067	16.769	0	9.294	13.622	0	Yes
Leyden	8.561	10.5	0	5.812	7.545	0	No
Oak Park	-4.266	-1.108	0	7.646	13.285	0	Yes
Orland	-8.52	-7.606	0	5.418	8.224	0	No
Palatine	11.24	12.772	0	8.197	10.856	0	No
Palos	-7.463	-6.964	0.277	6.714	9.072	0	No
Proviso	-12.001	-8.444	0	7.23	11.863	0	Yes
Rich	-10.805	-9.536	0.222	6.773	11.959	0	Yes
Riverside	-9.125	-7.647	0.014	8.654	11.875	0	Yes
River Forest	-10.137	-9.744	0.167	7.98	8.036	0.366	No
Schaumburg	12.489	13.312	0	6.058	9.551	0	Yes
Stickney	-15.125	-14.072	0.107	5.484	8.617	0	Yes
Thornton	-10	-7.481	0	5.278	10.019	0	Yes

Stratum	Non-Sales - Median Percent Change	Sales - Median Percent Change	Median Percent Change - Mann Whitney Test P-Value	Non-Sales - Median Absolute Deviation	Sales - Median Absolute Deviation	Median Absolute Deviation - Mann Whitney Test P-Value	Selective Reappraisal Suspected
Wheeling	12.944	14.196	0	6.406	10.828	0	Yes
Worth	-13.424	-13.193	0.76	5.388	7.451	0	No
Hyde Park	10.112	11.18	0.18	8.381	12.976	0	Yes
Jefferson	6.374	7.863	0	8.258	11.002	0	No
Lake	7.901	9.088	0	6.913	9.518	0	No
North	12.807	17.121	0	8.914	19.307	0	Yes
Lakeview	20.122	21.479	0.263	14.218	19.919	0	Yes
Rogers Park	9.142	12.379	0.005	9.104	11.096	0.002	Yes
South	10.572	14.224	0	9.126	13.229	0	Yes
West Chicago	9.686	20.162	0	10.268	19.474	0	Yes
Townhouses	6.954	10.034	0	14.256	14.505	0.014	Yes
Single-Fam Detached	3.899	8.867	0	14.588	15.179	0	Yes
Multi-Family	9.079	10.771	0	11.68	15.825	0	Yes
Mixed-Use	8.924	13.381	0.001	14.371	28.089	0	Yes
South Triad	-10.593	-8.592	0	6.969	10.588	0	Yes
Chicago	8.463	11.41	0	8.394	13.347	0	Yes
North Triad	12.051	13.149	0	7.779	10.882	0	Yes
County-Wide	5.018	9.168	0	14.15	15.229	0	Yes

MEMORANDUM OF AGREEMENT BETWEEN CCA AND CCAO

COOK COUNTY ASSESSOR
JOSEPH BERRIOS

COOK COUNTY ASSESSOR'S OFFICE
118 NORTH CLARK STREET, CHICAGO, IL 60602
PHONE: 312.443.7550 FAX: 312.603.3352
WWW.COOKCOUNTYASSESSOR.COM

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement ("Agreement") is made and entered into as of October 27, 2017 by and between the Cook County Assessor's Office ("CCAO") and Civic Consulting Alliance ("CCA"), collectively "the Parties."

This Agreement is entered into pursuant to an invitation by the Cook County Assessor and the Cook County Board President to CCA to share its expertise and private resources. CCAO desires to engage CCA to review, evaluate and make recommendations regarding the current and anticipated innovations in methodology employed by CCAO to assess residential property in Cook County for ad valorum tax purposes and to evaluate progress achieved after implementation of the innovations.

It is the intention of the Parties to share any and all information regarding the assessment process. However, certain information may be deemed Confidential and Proprietary. Throughout the duration of this Agreement, CCAO will disclose or share certain confidential work product and other proprietary information with CCA. Therefore, in consideration of the mutual promises and covenants contained within this Agreement, the Parties hereto agree as follows:

CCA, for itself and for its principals, trustees, board of directors, members, agents and related employees, consultants and vendors, acknowledges and agrees that draft work products to determine initial and post-appellate property market value and the thought processes require for such draft work products is Confidential and Proprietary information. This includes analytical or evaluative formula, calculations, pattern, compilation, program, method, technique, process, computer software/programming/code/source code, proprietary data and programs, deliberative processes, worksheets, work product including but not limited to manual adjustments to assessed values, emails, agreements, recordings and transcripts of all interviews of any employee of CCAO and any documents protected by any public access opinion of the Illinois Attorney General and the Freedom of Information Act. Confidential and Proprietary Information also shall include pre-regression model information (information used to create the regression model), post-regression model adjustments (hand checks), Industrial/Commercial Department spreadsheets and pre-spreadsheet information, and appeal worksheets.

However, Confidential and Proprietary Information shall not include publicly available information and data not subject to a Freedom of Information Act (FOIA) exemption, any information already or at any time of the term of this agreement released to third parties, the Residential Regression Models, Assessed Value 1st pass (notice of assessment) and 2nd pass, and Board of Review certified assessed value and appeal data (except worksheets). Publicly available information or information released to third parties in any fashion may be utilized for the purpose of creating reports.

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CCA shall provide the CCAO Legal Department with a memorandum of information reviewed during the course of CCA's work at the CCAO. The CCAO Legal Department shall review the CCA's memorandum and mark the items Proprietary and Confidential. Said determination may be reviewed by the parties.

CCA shall hold and maintain all such Confidential and Proprietary Information in the strictest confidence solely for the purpose and in connection with the relationship between the Parties and carefully restrict access to such Confidential and Proprietary Information only to essential employees of CCA or contractors of CCA on a need-to-know basis. Essential employees and contractors of CCA shall be those parties listed in or added to "Exhibit A" attached herein during the term of this Agreement. CCA has a duty to advise its employees and the parties listed in Exhibit A of the proprietary nature of the Confidential and Proprietary Information and of the obligations set forth in this Agreement and require such parties to keep the Confidential and Proprietary Information confidential and to not disclose it to any third parties, except as herein provided. Essential employees of CCA shall include volunteers, part-time employees, third-parties and experts, all who sign a confidentiality agreement to be bound by this Agreement. Except for those parties listed in Exhibit A, no contractor, consultant, educational institution, journalist, news outlet (print, broadcast, internet or otherwise), public interest advocate, policy institute, governmental office or agent of any pro bono partner of CCA shall have access to or be permitted to review such Confidential and Proprietary Information without the express written permission of the CCAO. CCA may allow access to the Confidential and Proprietary Information by a third party only upon the third party signing of a CCA Confidentiality Agreement, and agrees to be bound by this Agreement, and prior reasonable approval by CCAO.

CCA expressly reserves its right to confer periodically with the Cook County Board President or the President's designee regarding the progress of its above-referenced work with CCAO while maintaining its duty to hold and maintain all such Confidential and Proprietary Information in the strictest confidence and restricted access described above. CCA may disclose Proprietary and Confidential Information that the President's Office may request. Prior to such disclosure, the President's Office shall sign a confidentiality agreement and be subject to the confidentiality requirements of this Agreement.

Attached herein as Exhibit "B" is CCA's internal confidentially agreement that CCA requires each of those parties listed in Exhibit "A" to sign prior to receiving and maintaining access to the confidential information referenced in this agreement. CCA shall keep a written log of each and every party who signs Exhibit B. CCA's internal confidentiality agreement shall require that each signatory personally agree to be bound by the terms of this agreement between CCA and CCAO.
CCA shall be solely responsible for providing physical and electronic security for the Confidential Information. Upon detecting or receiving notice of any breach of security and/or breach of confidentiality, CCA shall notify the Legal Department of the CCAO within one (1) day and provide sufficient information as to what Confidential Information was released, to whom the Confidential and Proprietary Information was released and the circumstances of the unauthorized release.

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CCA shall not publish, copy, release, share, transfer, discuss, seek consultation regarding or otherwise disclose the Confidential and Proprietary Information to others unless otherwise permitted under this Agreement or agreed by the Parties in writing. CCA shall neither use the Confidential and Proprietary Information for CCA's own benefit nor within reason permit (1) others to use the Confidential and Proprietary Information for their own benefit or (2) ever by anyone to the detriment of CCAO except as provided herein or as expressly permitted in writing by the Cook County Assessor or his authorized designee. CCA shall not permit any Confidential and Proprietary Information to be transmitted to or received by any other public body, office or agency except as provided herein or as expressly permitted in writing by the Cook County Assessor or his authorized designee or otherwise required by law.

All writings, inventions, discoveries, improvements and other technology and works for hire, whether eligible for patent or copyright protection or not as well as all patent applications, patents or copyrights based thereon (collectively, the "Inventions) that are discovered, made, authored or conceived by the CCA and others acting on behalf of CCA, as listed in Exhibit A, during and in connection with this Agreement shall not be used for any for-profit commercial purpose, sold, licensed, or leased with a view to a profit. CCA promptly shall disclose to CCAO the making, conception or reduction to practice of any Inventions by anyone working on behalf of CCA in any capacity.

CCA shall be acting as an independent pro bono consultant solely to CCAO regarding its work as detailed above. CCA is not an employee, agent or subsidiary public body of any office of Cook County or the State of Illinois. Therefore, CCA expressly acknowledges that it has no obligation to place or conduct itself as being in any way subject to the Freedom of Information Act of the State of Illinois (5 ILCS 140/1 et seq.).

In the event that CCA is subject to a subpoena or receives a freedom of information request for documentation, CCA shall hand-deliver and e-mail copies of the subpoena or the request to the Legal Department of CCAO Office within two (2) business days of receiving the subpoena or request.

CCA shall return to CCAO any and all records, notes, and other written, printed, or tangible materials in its possession and all other documents, materials, notes or copies ("notes") which may have been converted to any computerized media in the form of any image, data or word processing files either manually or by image capture or any other form of work product that may be based on or include any Confidential and Proprietary Information, in whatever form of storage or retrieval, upon the completion or termination of this Agreement. Alternatively, with the prior written consent of such party and as may be authorized under the Local Records Act of the State of Illinois (50 ILCS 205/1 et seq.), the other party may destroy (in the case of CCA Notes, at CCA's sole discretion) any copies of the foregoing embodying Confidential and Proprietary Information (or the reasonably non-recoverable data erasure of such computerized data) and, upon request, certify in writing such destruction of the material and/or information.

Upon completion of each phase of CCA's work, CCA may summarize any report of its findings and recommendations delivered to CCAO and forward the summary to the Cook County Board President or

the President's designee. The Parties agree that conclusory statements contained in any such summary shall not be deemed Confidential and Proprietary information. CCA agrees that any summary shall not cite to any Confidential and Proprietary information under this Agreement. Prior to finalization of the summary, CCAO shall review the summary to ensure no disclosure of any Confidential and Proprietary Information and report its assent or specific concerns no more than one (1) business day after receiving the summary.

CCA acknowledges and agrees that the Confidential and Proprietary Information hereunder this Agreement is of a unique, valuable and sensitive nature, and that unauthorized release and distribution of the Confidential and Proprietary Information potentially could severely disrupt the pre-decisional deliberative communications among the CCAO employees that are integral to the deliberative decision-making process of CCAO's official duties and so lead to public loss. The damages that could occur from such a breach of duty to protect the information would be impossible to calculate. Therefore, both parties hereby agree that CCAO shall be entitled to claim injunctive relief and to attorney fees should CCAO seek outside counsel upon the final judgement by a court of competent jurisdiction against CCA.

This Agreement constitutes the entire understanding between the parties and supersedes any and all prior or contemporaneous understandings and agreements, whether oral or written, between the parties, with respect to the subject matter hereof. This Agreement can only be modified by written amendment signed by the party against whom such enforcement is sought.

The validity, construction and performance of this Agreement shall be governed and construed in accordance with the laws of the State of Illinois or any applicable federal laws or statutes applicable to contracts made and to be wholly performed within Illinois, without giving effect to any form of conflict of law provisions thereof. The Federal and State courts located in Cook County, Illinois shall have sole and exclusive jurisdiction over any disputes arising under the terms of this Agreement.

Any such failure by either CCAO or CCA to enforce the other party's strict performance of any provision of this Agreement shall not constitute a waiver of its right to subsequently enforce such provision or any other provision of this Agreement.

Although the restrictions herein contained in this Agreement are considered by CCAO and CCA to be reasonable for the purpose of protecting the Confidential and Proprietary Information, if any such restriction is found by a court of competent jurisdiction to be unenforceable, such provision will be modified, rewritten or interpreted to include as much of its nature and scope as will render it enforceable. In the event it cannot be so modified, rewritten or interpreted to be enforceable in any respect, it will not be given effect, and the remainder of the Agreement shall be enforced as if such provision was not included.

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This Agreement and CCA's duty to hold the Confidential and Proprietary Information of CCAO in confidence shall remain in effect until the year 2117. The nondisclosure provisions of this Agreement shall survive the termination of any relationship between the Parties.

This Agreement is personal in nature, and CCA may not directly or indirectly assign or transfer it by operation of law or otherwise without the prior written consent of CCAO. All obligations contained in this Agreement shall extend to and be binding upon the parties to this Agreement and their respective successors, assigns and designees.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the aforementioned effective date.

For Civic Consulting Alliance

Signature

Brian Fabes, CEO
Print Name & Title

31 OCT 2017
Date

For Cook County Assessor's Office

Signature

CHRISTOPHER M CROWLEY CCAO CD
Print Name & Title

10.30.17
Date

ABOUT JOSH MYERS (CURRICULUM VITAE)

- See details on www.joshmyersvaluationsolutions.com
- Curriculum Vitae: https://www.dropbox.com/s/fcujdh04ruotf5v/CV%208.pdf?dl=0

KNOWLEDGE AND SKILLS

Statistics
General knowledge of advanced statistics, probability, and mathematics. Expertise in the application of advanced regression modeling and statistical analysis to real-world data.

Software
R, Python, SPSS, NCSS, Minitab, SAS, and SQL. Skill in software design.

EXPERIENCE

Statistical Consultant and President, Josh Myers Valuation Solutions - 02/2013 to Present
Josh Myers Valuation Solutions offers a wide-array of consulting services for the Mass Appraisal Field including regression model building and implementation, ratio study analysis, other forms of statistical analysis, expert witness testimony, and business process analysis. Clients include local governments, CAMA software vendors, IAAO (International Association of Assessing Officers), and IPTI (International Property Tax Institute).

Co-Founder and Director of Statistics, Delivery Value System - 09/2014 to Present
Responsibilities consist of managing Delivery Value System's baseball analytics operation, including all statistical modeling and statistical reports generated both internally and for clients.

Business Systems Analyst, Thomson Reuters: Tax and Accounting - Government Division - 12/2011 to 01/2013
Responsibilities included the design of statistical and modeling functionality for their next-generation appraisal software.

CAMA Modeler Analyst, City of Norfolk, Va. - 10/2008 to 12/2011
Primary responsibilities included the design of regression modeling methodology, strategy, and implementation.

EDUCATION

University of Virginia
Master of Science - 2007
Field: Statistics
GPA: 3.468 / 4

University of Virginia
Bachelor of Science - 2005
Double Major: Physics and Mathematics
GPA: 3.319 / 4

PUBLICATIONS

Journal of Property Tax Assessment and Administration
"Using Geographic Attribute Weighted Regression for CAMA Modeling"
Applied a modified form of Geographically Weighted Regression to three mass appraisal data-sets. The model achieved the best results when compared to other competing models. Article was co-authored with J Wayne Moore, PH.D.

PROFESSIONAL ACCOMPLISHMENTS

IAAO Outstanding Technical Essay Award (2011) - "Using Geographic Attribute Weighted Regression for CAMA Modeling"

Member of the IAAO / IPTI Editorial Review Board (2011 - present) - Periodically reviews technical essays for publication
Expert Witness Testimony (2015) - Appeared before the North Carolina Property Tax Commission
Member of IAAO Technical Standards Sub-Committee (2016 - 2017) - Prepares technical mass appraisal standards
Member of IAAO AVM Global Credentialing Task Force (2018) – Working on a global credential for the use of AVMs

CONFERENCE PRESENTATIONS

Aumentum User's Group Conference

- 2009 - "Improving CAMA Modeling With GIS Location Data" (Along with J. Wayne Moore PhD)
- 2011 - "GAWR Extended Research: Using GIS X-Y Location Coordinates To Improve Market Value Estimates" (Along with J. Wayne Moore PhD)
- 2011 - "Handling Sales In ProVal - A Window into the City of Norfolk's Sales Archiving Process"
- 2014 - "Regression Modeling Using Third Party Tools"

GIS & CAMA Technologies Conference

- 2010 - "Using Geographical-Attribute Weighted Regression for CAMA Modeling" (Along with J. Wayne Moore PhD)
- 2011 - "GAWR Extended Research" (Along with J. Wayne Moore PhD)
- 2012 - "Comparing Vertical Inequity Detection Methods Using Simulated Data"
- 2013 - "How to Detect Vertical Inequity More Accurately"
- 2014 - "The COD: A Misunderstood Measure of Equity"
- 2014 - "Location: The Great Equalizer"
- 2015 - "What's So Great about R? - The Skinny on the R Statistical Software"
- 2016 - "Unique Applications of Geographically Weighted Regression"
- 2017 - "Vertical Equity Decathlon: PRD vs. PRB"

GIS & CAMA Technologies Conference Pre-Conference Workshop

- 2016 - "Basics of the R Statistical Software"
- 2017 - "Basics of the R Statistical Software"

IAAO International Conference on Assessment Administration

- 2010 - "Using Geographical-Attribute Weighted Regression for CAMA Modeling" (Along with J. Wayne Moore PhD)
- 2012 - "Evaluating Vertical Inequity Detection Methods Using Simulated Data: Problems and Solutions"
- 2013 - "Testing Geographic Attribute Weighted Regression (GAWR) and New Cost Models in Jefferson County, Kentucky" (Along with J. Wayne Moore PhD and Tony Lindauer)
- 2014 - "Impact of Heterogeneity and Age on COD"
- 2015 - "Improving Data Quality Using Statistical Analysis"
- 2017 - "Vertical Equity Examined and Options Reviewed" (Panel along with Robert Denne, Alan Dornfest, Carmela Quintos PhD, and Mark Sunderman PhD)
- 2017 - "Standard on Automated Valuation Models (AVM's)" (Panel along with August Dettbarn, Alan Dornfest, and Patrick O'Connor)

Virginia Association of Assessing Officers Annual Conference

- 2016 - "Five Things You Probably Don't Know About Ratio Studies"

Virginia Association of Assessing Officers Educational Seminar

- 2013 - "Statistical Observations on Mass Appraisal"

IPTI Spatial Analysis Symposium

- 2011 - "R Software for Analysis in Real Estate Assessment"
- 2011 - "GAWR Research"

North Carolina Department of Revenue Advanced Real Property Seminar

- 2014 - "Mass Appraisal Modeling Using GIS"

ABOUT CIVIC CONSULTING ALLIANCE

Civic Consulting Alliance's mission is to make the Chicago region a great place for everyone to work and live in. By leveraging the support of the Civic Committee of the Commercial Club of Chicago (collectively the major private employers in the region) with incomparable professional resources and committed leaders, CCA provides consulting services to clients to help address the region's most pressing problems and greatest opportunities in four areas: Education; Criminal Justice and Public Safety; Economic Vitality; and inclusive Civic Leadership.

At no cost to the taxpayer, CCA works on a pro bono basis with governmental and not-for-profit clients who commit to collaborate on important strategic and operational change and achieve significant reforms. In Fiscal Year 2017, 37 partner firms provided pro bono support for 54 cross-sector projects. Together, CCA, its partners, and its clients accomplish more than any one firm or sector can on its own.

UNDER STRICT EMBARGO UNTIL 2/15/2018

THIS DOCUMENT IS A COMPANION APPENDIX TO
RESIDENTIAL PROPERTY ASSESSMENT IN COOK COUNTY,
A REPORT DEVELOPED BY THE CIVIC CONSULTING ALLIANCE FOR THE COOK COUNTY BOARD OF COMMISSIONERS AND THE COOK COUNTY ASSESSOR

TO ACCESS THE FULL REPORT, VISIT
WWW.CCACHICAGO.ORG/IMPACT/CLIENT-REPORTS/

Civic Consulting alliance

the engine of public-private collaboration