



## Approaches to Analytics – Based Fraud Detection



A Quest Diagnostics Company

Midwest Medical  
Directors Association

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# What is Fraud?

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In the legal sense, fraud is a strict function of intent.  
In the operational and financial senses, the boundaries between fraud, negligence, and suboptimal underwriting are less clear.

## Culpability

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## Consequences

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# Organized Fraud

Irish Traveler Identification

# Affinity Fraud

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**ExamOne identifies ~120 unique affinity-fraud applications per year – roughly 1 every 3 days**

- Ethnic and clan-based networks engaged in organized life insurance fraud
  - Certain gypsy groups
  - Irish Travelers
- Highly amenable to analytics-based identification
  - High geographical concentration
    - North Augusta, SC
    - Milledgeville, GA
    - Aiken, SC
  - Prevalence of uncommon surnames
  - Consistent set of difficult-to-verify occupations
  - High historical application activity
  - Tendency to apply through a small number of identifiable agents

# Affinity Group Fraud

Irish Traveler and Gypsy fraud rings tend to operate through a small number of identifiable agents

Agent	Likely YTD Irish Travelers Cases
A	4
B	5
C	6
D	8
E	5
F	8
G	5

Applicants include a 74 year-old man with a Risk IQ score of 98 who has applied through ExamOne 11 times in the past ten years, and a 63 year-old man with a score of 99 who has applied three times in the past five years.

# Fraud, Negligence, and Incompetence

Analytics-based Examiner Quality Assessment

# How can we know that an examiner's measurements are reliable?

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- Independent verification through alternate data sources?
  - Costly
  - Time-consuming
  - May be unavailable
    - If reliable alternative sources of biometrics existed, wouldn't they already be in use?
- Applicant complaints of inaccuracy?
  - Not all misreporting results in complaints
  - Applicants unlikely to complain of *favorable* errors (and may sometimes induce them).
  - Applicants may falsely complain of correct but unfavorable results.
    - "My blood pressure has always been 120/80 before!"
- Spot checks/secret shopper approaches
  - Limited scale
  - Examiners sometimes identify secret shoppers
  - Unlikely to detect cases of collusion or applicant/producer inducement

# Which of these coins is fair?

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## Coin A

Random sequence of 50/50 flips

T H H H H H T T T T T T H H T H H H T T T T H H H T T

## Coin B

Biased sequence designed to reduce repetition

T H T T H T H H T H T H T H T H T H T H T H T H H T H

**Humans are poor random number generators**



# Key Indicators of Quality and Veracity

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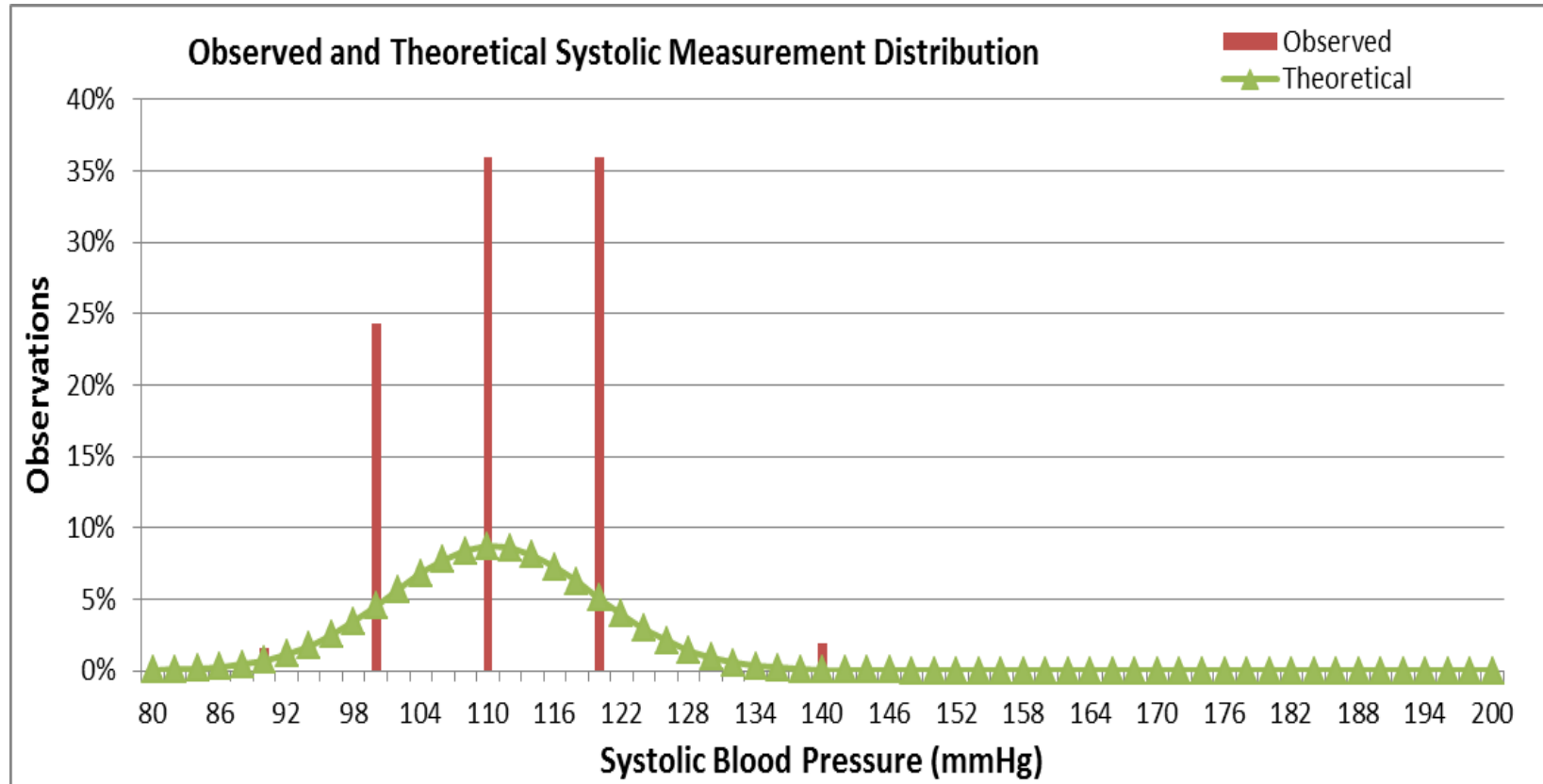
Variables Assessed
Physical Measurement Completion
Glycolysis Rate
Blood Pressure Measurement Repetition
Systolic Blood Pressure Distribution
Diastolic Blood Pressure Distribution
Pulse Distribution
Height Distribution
Weight Distribution

# Abnormal Result Distributions as Misconduct Indicators

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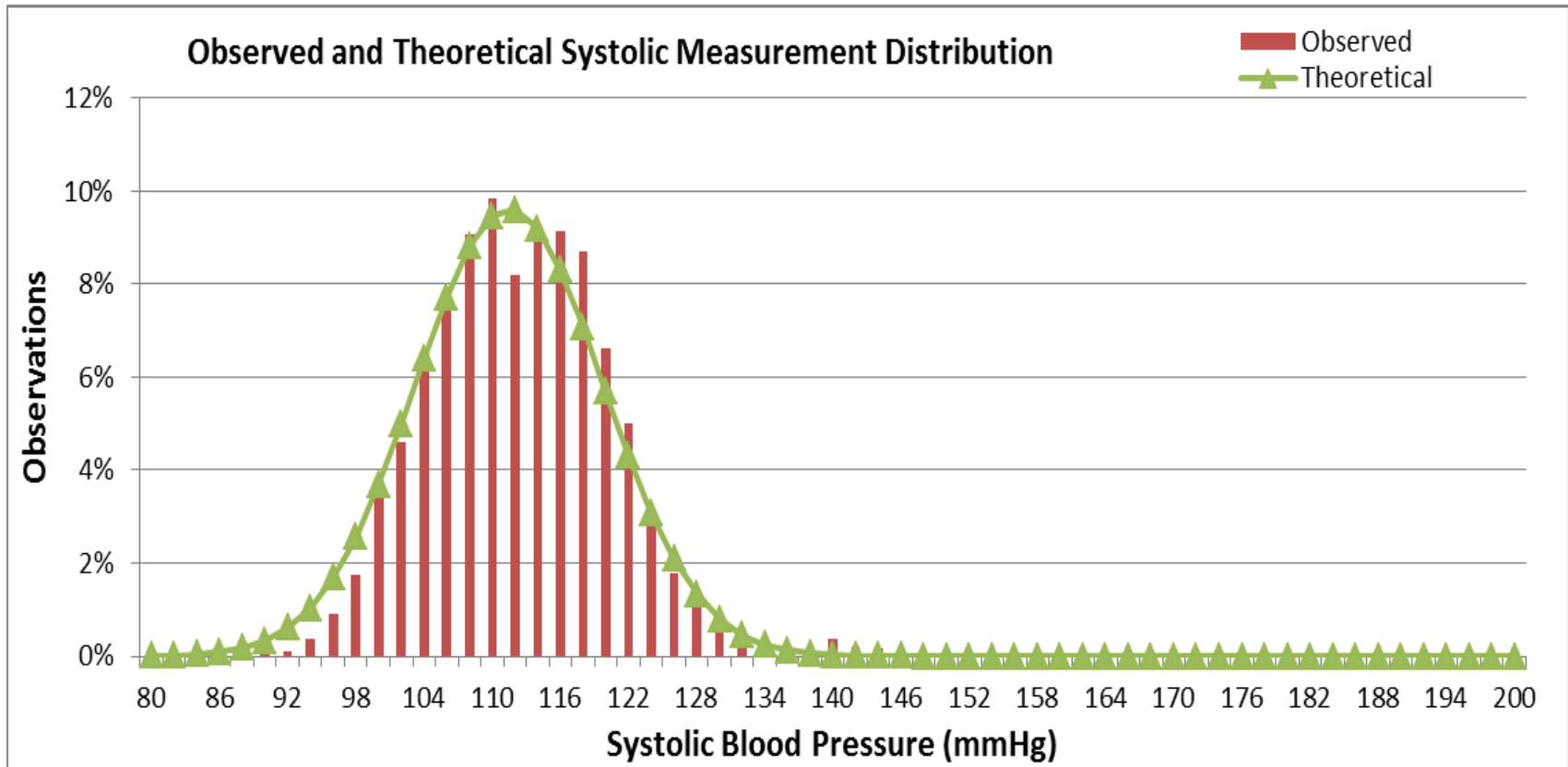
- For most applicant measurements, the true distribution of results is known
  - Normal
  - Lognormal
  - Uniform
  - ...etc.
- A large majority of examiners who engage in result fabrication will fail to replicate these distributions.
  - Deviations can be quantified statistically, but...
  - Few deviations are subtle or ambiguous.

# “Unacceptable” Systolic Blood Pressure Distribution



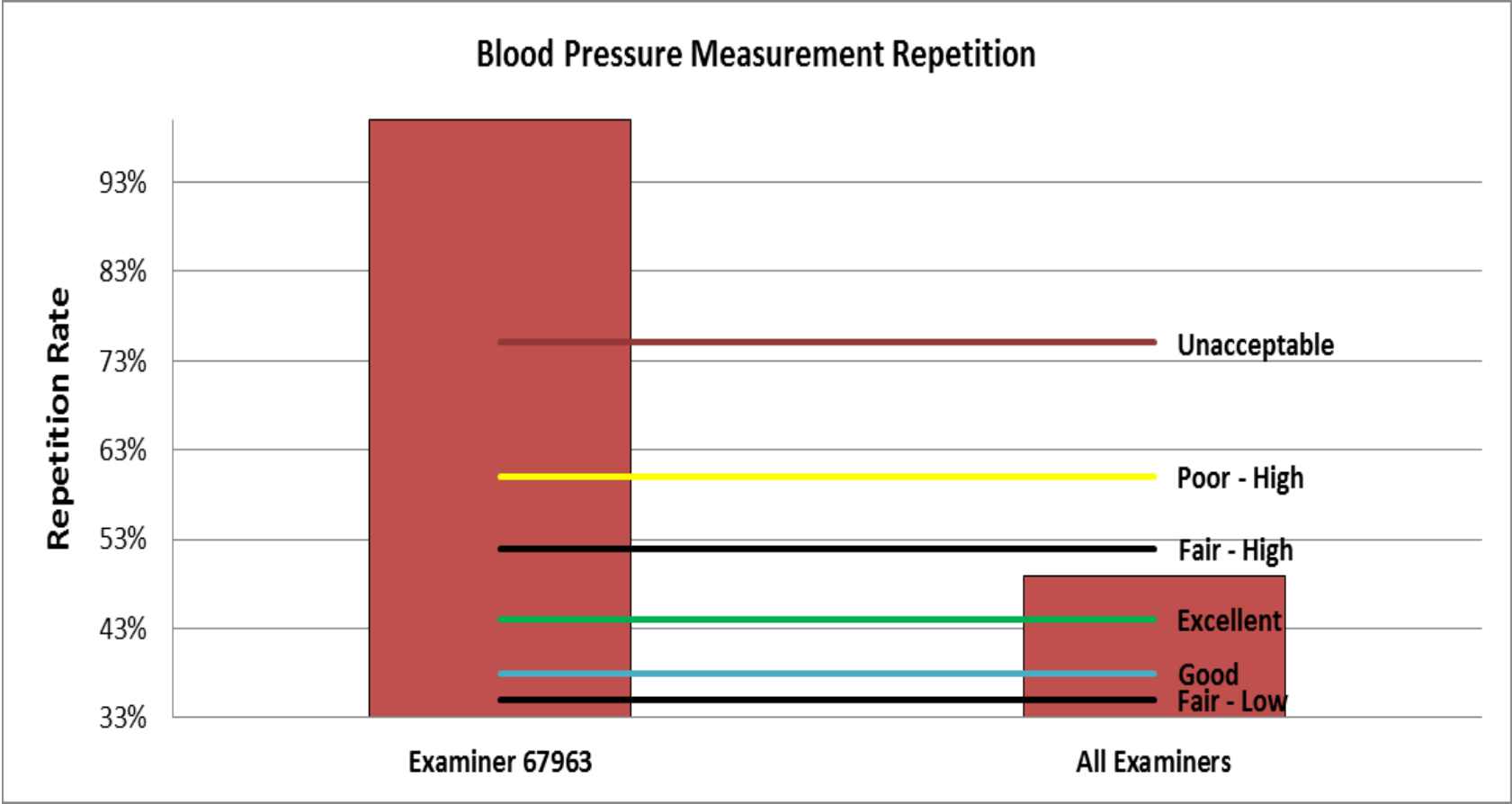
Collections: 103

# “Excellent” Systolic Blood Pressure Distribution



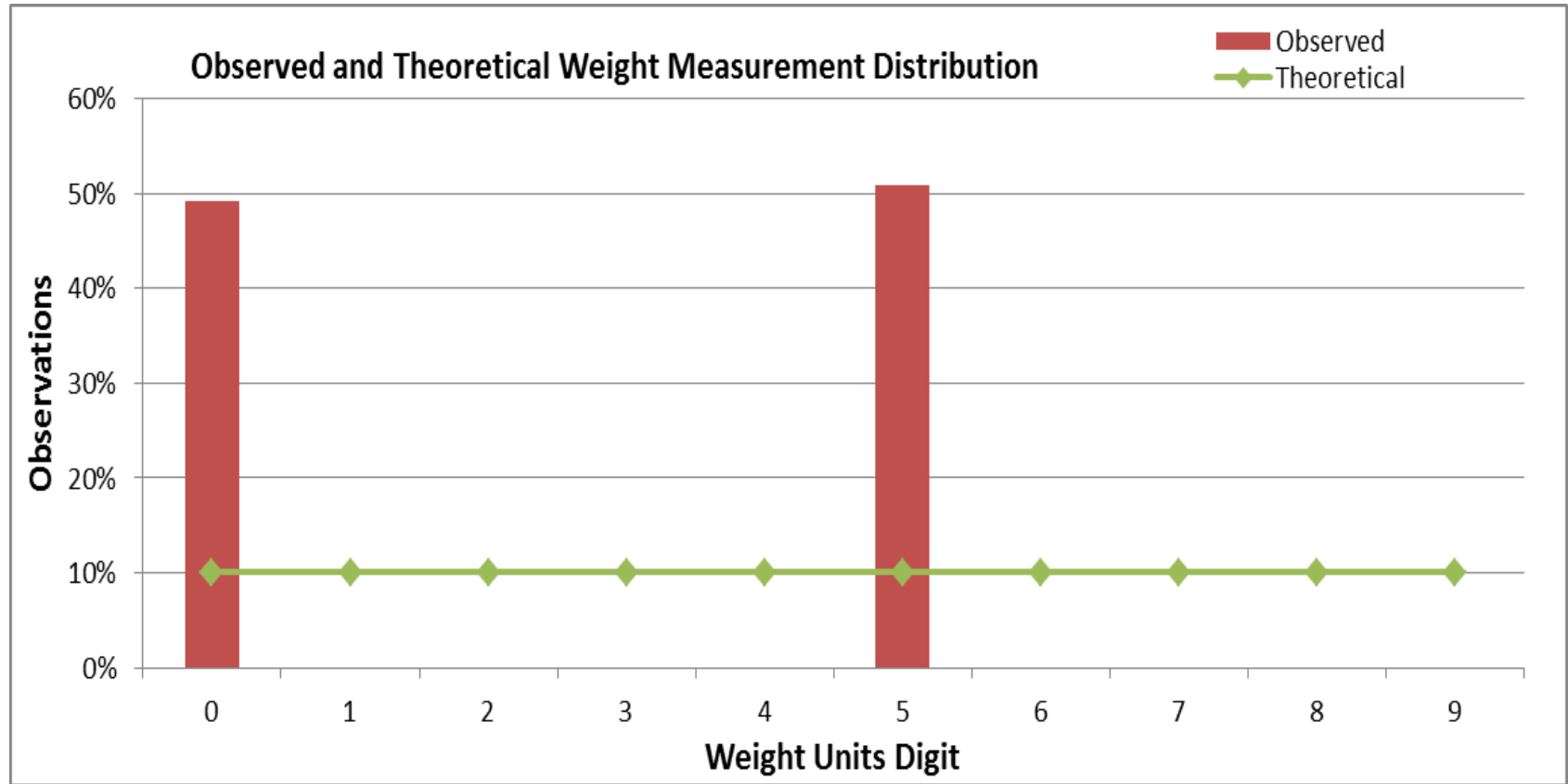
Collections: 614

# “Unacceptable” Blood Pressure Measurement Repetition Rate



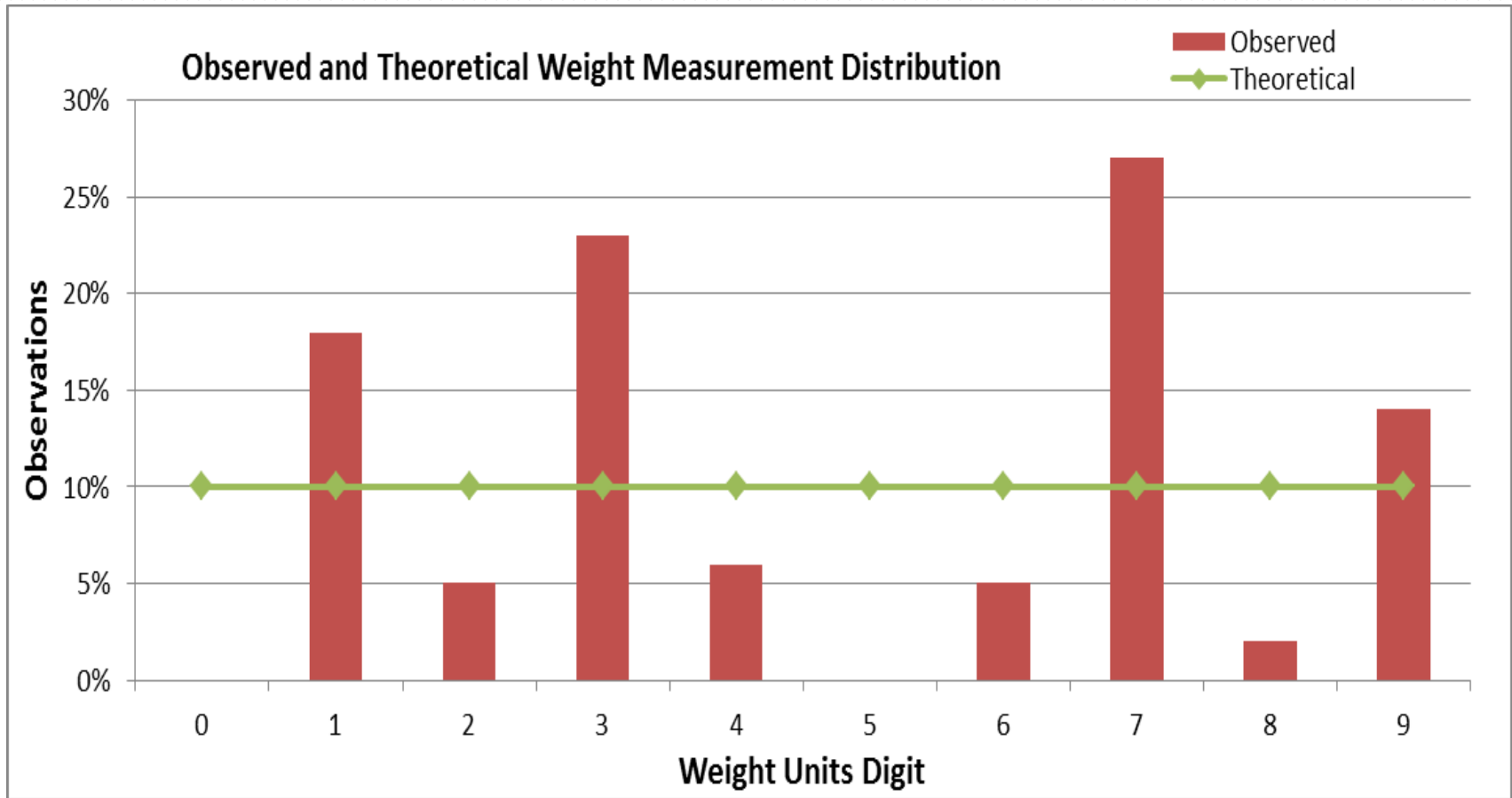
Collections: 144

# “Unacceptable” Weight Measurement Distribution



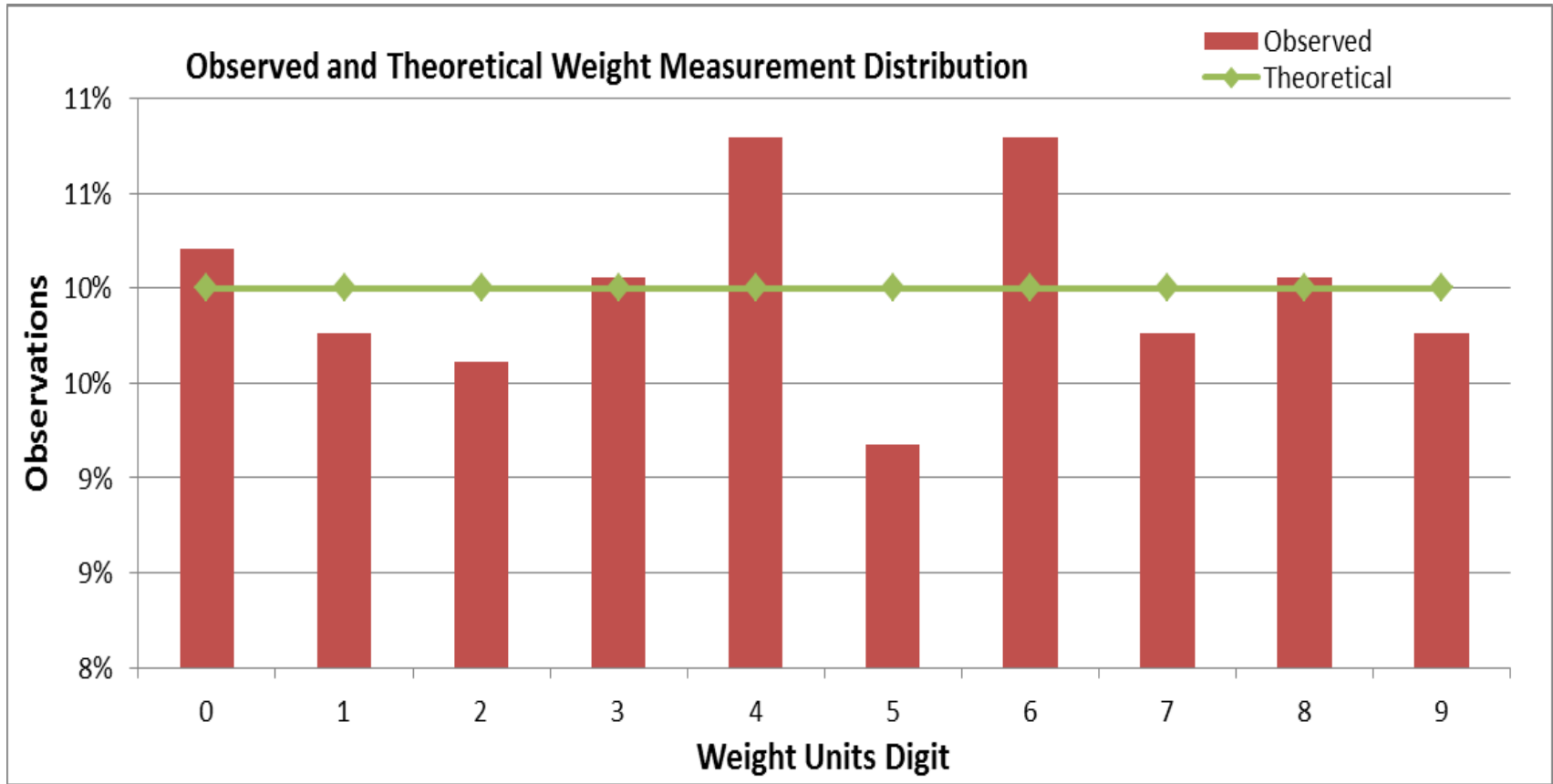
Collections: 57

# “Unacceptable” Weight Measurement Distribution



Collections: 64

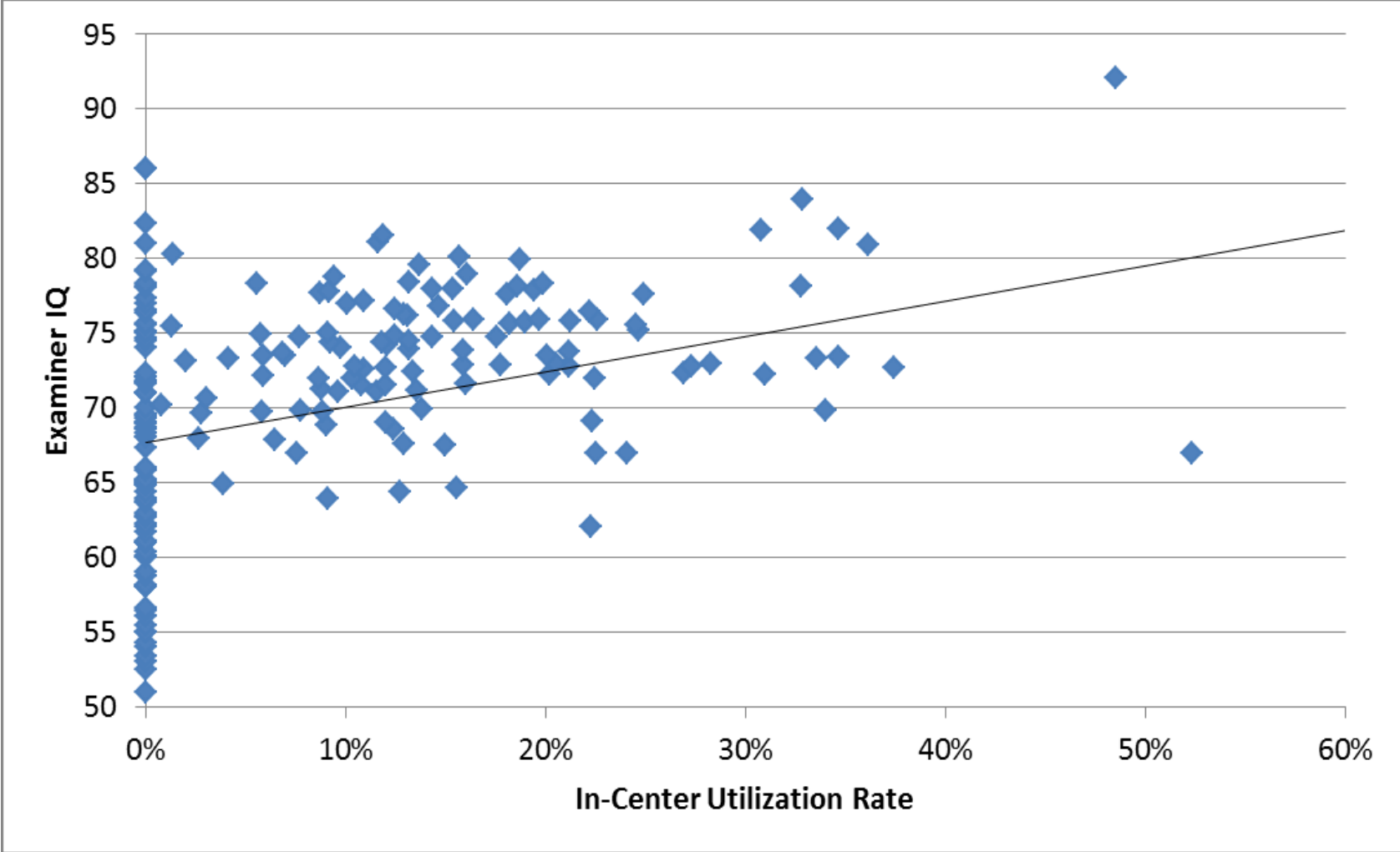
# “Excellent” Weight Measurement Distribution



Collections: 676



# Office Quality is Positively Correlated with In-Center Collections



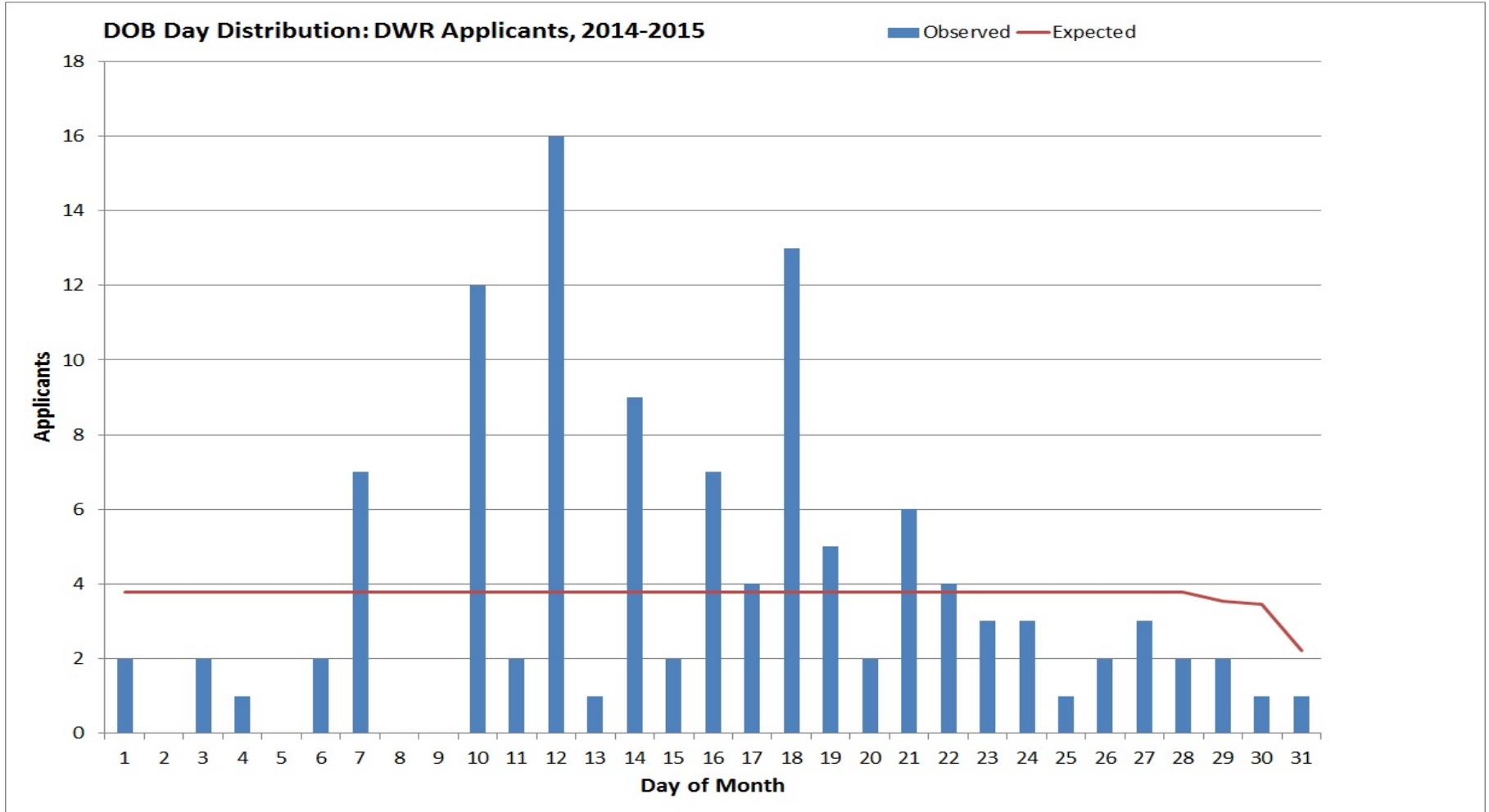
# Detection of Fictitious Applicants

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- Applicant DOB Distributions
  - When applicant DOB's are fabricated, the resulting distribution will rarely correspond to that in a real applicant population.
  - Day-of-Month distributions seem to offer the best level of resolution
  - Instrumental in one major examiner-related fraud case in 2015.
  - Benign abnormalities:
    - Repeated applications by a single individual in low-volume agents.
    - Immigrant populations without a tradition of commemorating birthdays.
      - Many older Hmong have legal birthdays on either June 15<sup>th</sup> (“born in the rainy season”) or December 15<sup>th</sup> (“born in the dry season”).
    - Agent failure to record legitimate DOB.
      - e.g., all DOBs reported as '01Jan'.

# DOB Distribution in a Confirmed Fraud Case

Chi-Square p-value: 1 in 10 trillion



# Agent-Related Fraud and Underwriting Issues

# Non-Laboratory Misconduct Metrics

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## An Emerging Topic for ExamOne Analytics

- Agent-Examiner Interactions
  - Over-representation of single examiner (relative to geographic area) among an agent's applications.
  - May indicate/provide opportunities for collusion.
  - Benign interpretations:
    - Agents consistently prefer and seek out high-quality examiners.
    - Ideally, examiner quality is independently confirmed by Examiner IQ (not possible without laboratory data).

# Laboratory-Based Agent Misconduct Metrics

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Most ExamOne fraud analysis has drawn primarily on laboratory data

- False-Negative Self-Reporting (FNSR)
  - Discrepancies between self-reported medical/risk statuses and laboratory or paramedical confirmations:
    - Tobacco Use (directly confirmed with cotinine)
    - Diabetes (directly confirmed with serum glucose or A1c)
    - Hypertension (directly confirmed in paramedical exam)
    - Obesity (directly confirmed in paramedical exam)
    - Heart Disease (indirectly indicated by lipid panel or NT-ProBNP)
- Mean mortality risk of submitted applications
  - As assessed with Risk IQ (ExamOne's laboratory-based mortality risk score).

# Obesity Non-Disclosure

## Telephone Interview Build as Confirmed by Paramed

Confirmed Build Class (BMI Range)	Self-Reported Build Class				Underreporting
	Morbidly Obese	Obese	Overweight	Normal	
Morbidly Obese (40+)	66.4%	32.1%	0.8%	0.6%	33.6%
Obese (30 - 39.9)	1.4%	77.9%	19.9%	0.8%	20.7%
Overweight (25 - 29.9)	0.1%	4.3%	83.1%	12.6%	12.6%

5.2% of applicants understate their weight by 25 lbs. or more.

# False-Negative Self-Reporting Rates by Agent

Review of available data from one large carrier

Agent	N	False-Negative Self-Reports			Hazard Score	%Risk IQ 99
		HBP	Tobacco	Diabetes		
All ExamOne	7553423	57.9%	21.1%	52.9%	122.6	0.9%
A	975	100.0%	80.2%	96.1%	167.7	3.2%
B	392	94.1%	50.0%	69.6%	142.1	1.5%
C	281	100.0%	74.2%	40.0%	120.9	1.2%
D	277	75.0%	46.7%	81.3%	140.5	1.6%
E	241	58.3%	55.6%	69.6%	222.8	2.7%
F	215	42.9%	61.8%	28.6%	136.4	3.1%
G	174	41.2%	25.0%	57.1%	219.8	5.0%
H	160	0.0%	61.5%	50.0%	195.3	1.3%
I	153	100.0%	39.3%	71.4%	249.8	2.8%
J	136	75.0%	57.1%	44.4%	242.4	5.6%

Above all-applicant baseline



## Further Details on “Agent A”

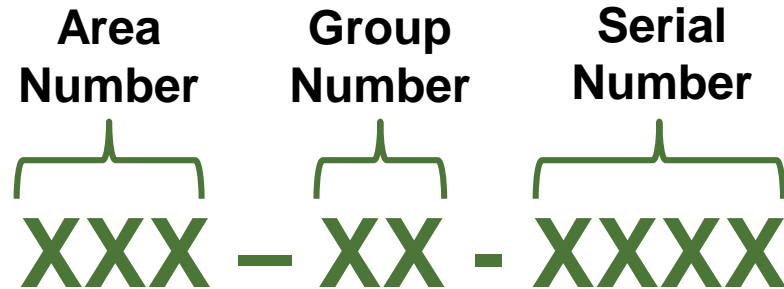
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- Applicant base consisted entirely of recently resettled ethnic Chin refugees.
  - Agent was longer-established member of the same ethnic group.
- Virtually all policies were for precisely \$100,000.
- Applications were tightly clustered in time and space.
  - 8 in Atlanta between 9/3 and 9/6.
  - 11 in Dallas between 9/22 and 9/24
  - 7 in Indianapolis between 11/3 and 11/6

# Recent Immigrants and Non-Disclosure

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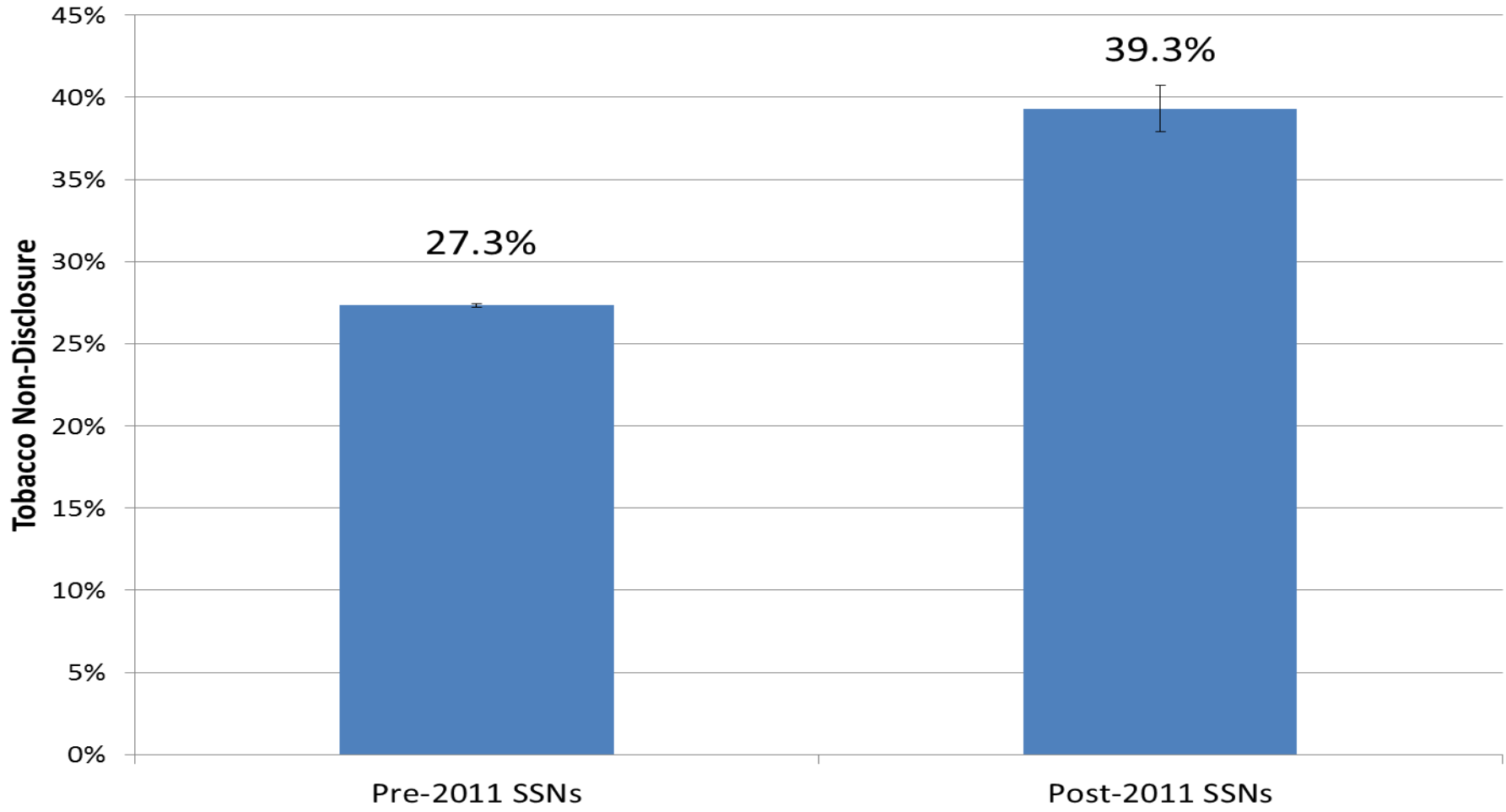
## Structure of a Social Security Number



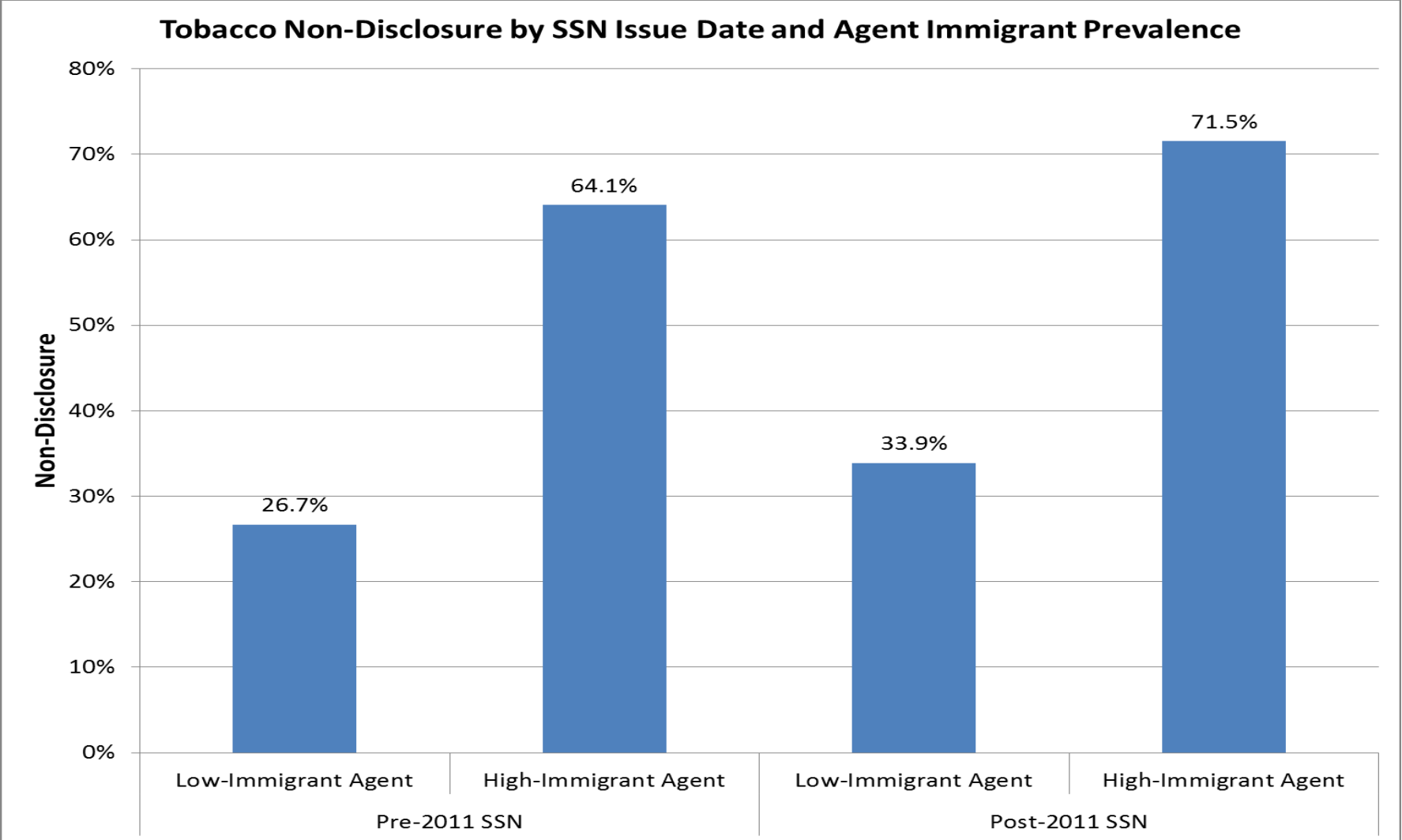
- Since 2011, the Social Security Administration has allocated new SSNs on a randomized basis.
- This change has made available many previously unallocated area/group number combinations.
- If an adult carries an SSN which could not have been issued prior to 2011, there is a substantially increased likelihood that this individual is an immigrant.
  - This metric is not decisive on an individual level, but is useful for population-based analyses.

# Presumptive Immigration Status and Tobacco Non-Disclosure

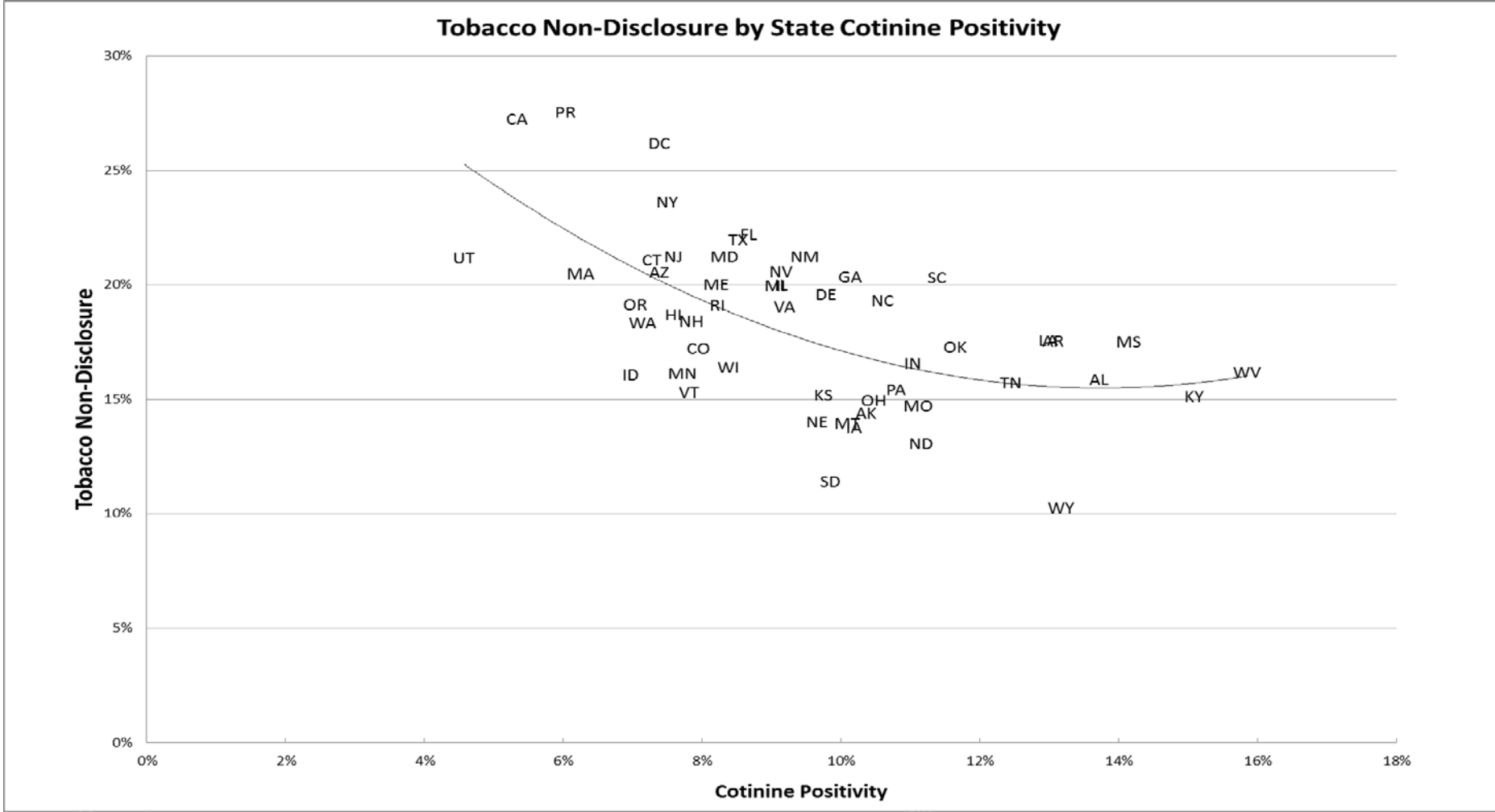
**Tobacco Non-Disclosure by SSN Issue Date**



# Independent Effect of Agent Post-2011 SSN Rate on Tobacco Non-Disclosure



# Local Tobacco Use Rates as a Predictor of Non-Disclosure



# Observations on Non-Disclosure

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- Non-disclosure for plausibly undiagnosed conditions (diabetes and hypertension): 50-60%
- Non-disclosure in conditions almost certainly known to the applicant (tobacco use and obesity): 15-30%
- Presumptive immigration status, immigrant prevalence in agent's customer base, and agent identity are independent risk factors for non-disclosure

# Sentinel Effects and Prospects for SI and Accelerated Underwriting

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- In a fully underwritten environment, where detection is all but inevitable, 15-30% of applicants positive for a confirmable condition will knowingly misreport their status.
- As the probability of detection wanes under emerging underwriting paradigms, the expected returns to non-disclosure will rise, raising new challenges of fraudulent misreporting and adverse selection.
- Present value of premium savings from avoiding a smoker classification in 20-year term policies:
  - 20 year-old female, \$100,000 face amount: \$180
  - 60 year-old male, \$1 million face amount: \$50,000

Thank you