

Determining Variation in Waste Generation

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Trends in Waste Generation

Historical assumption:

Waste generation increasing (USEPA)
(recently: leveled off?)

Defined by attributes of generator

income

age

household size

land use (urban-suburban-rural)

Seasonal trends (greater in summer)

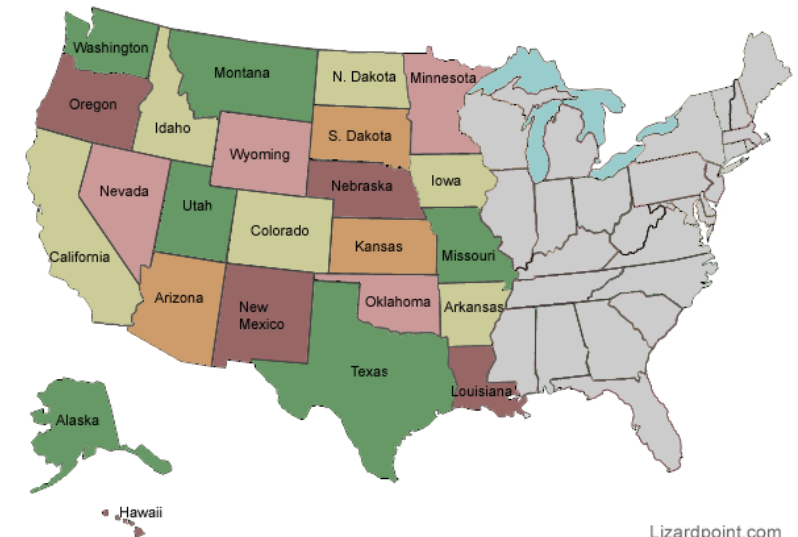
But also clear programs define numbers

Smithtown: manages all residential-commercial MSW

Southampton: drop-off materials in Town bags only

Applies across states: EREF report

	lbs/p/d	Δ regional mean
Colorado	10.8	+49%
Kansas	5.2	-30%
Nebraska	5.8	-20%
New Mexico	4.9	-34%
Utah	5.5	-25%
Wyoming	8.4	+15%

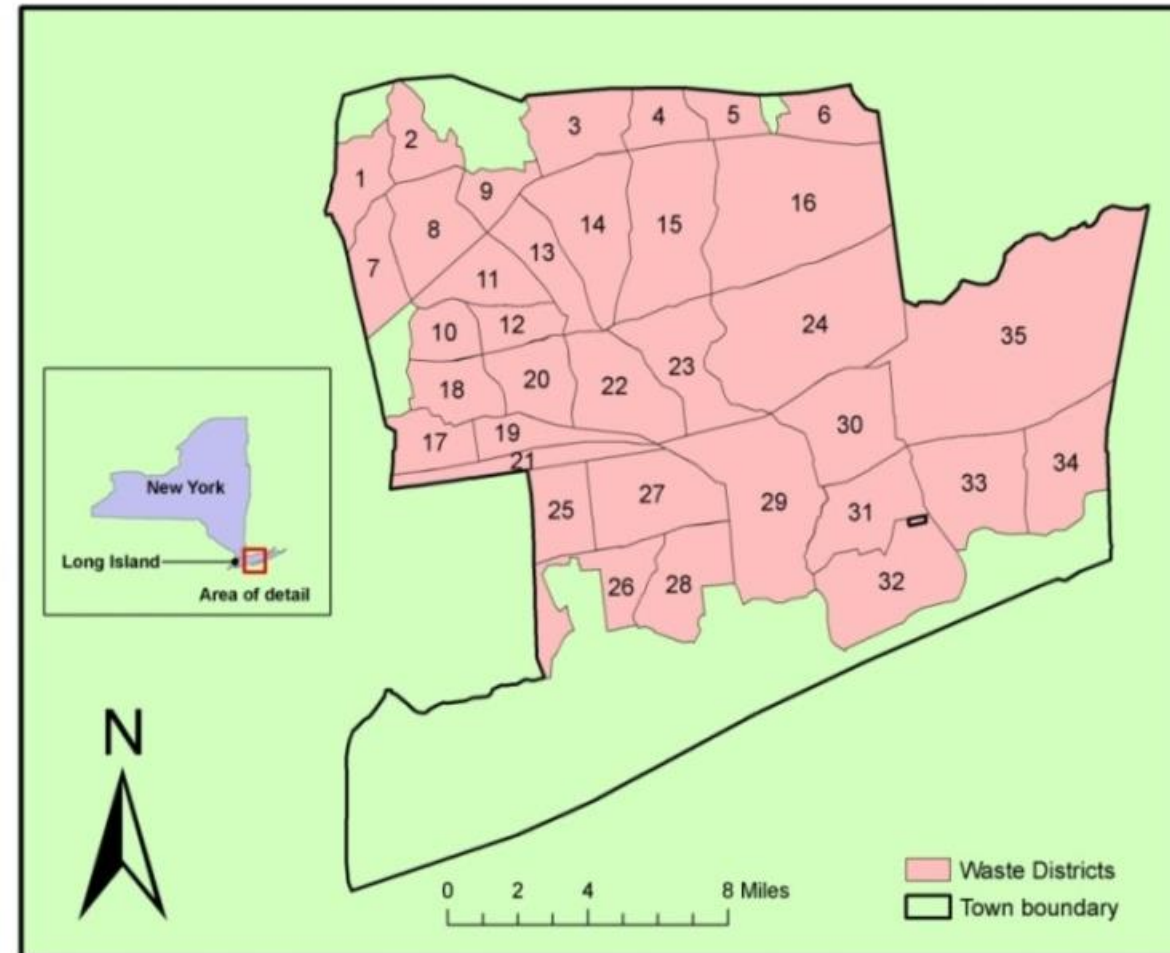


Study single program

Consistent rules, program, operations

However: limited scope for findings?
Comparisons possible?

Material here: Town of Brookhaven
(35 waste districts)



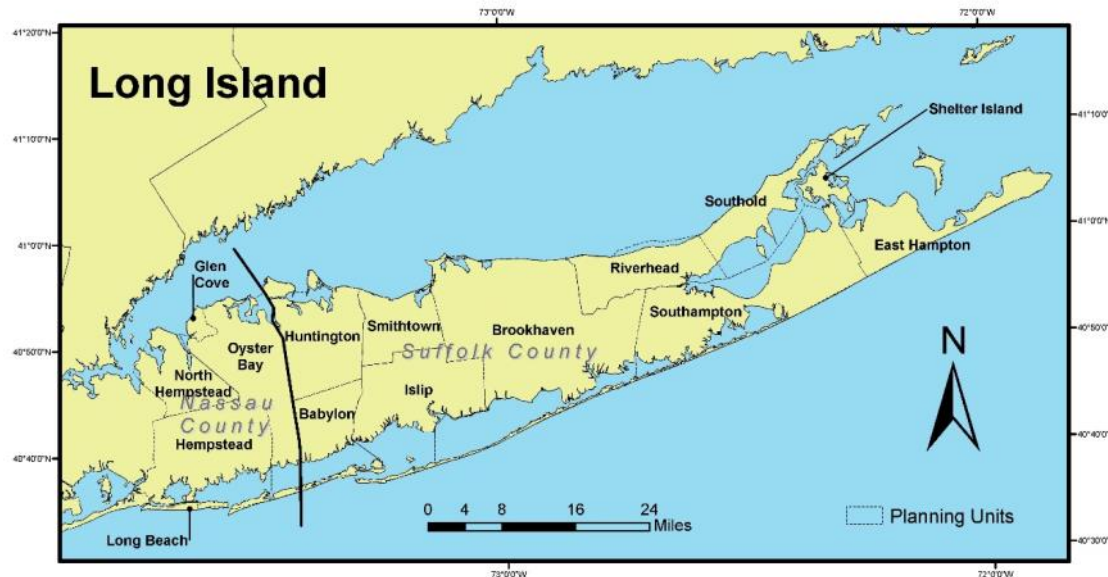
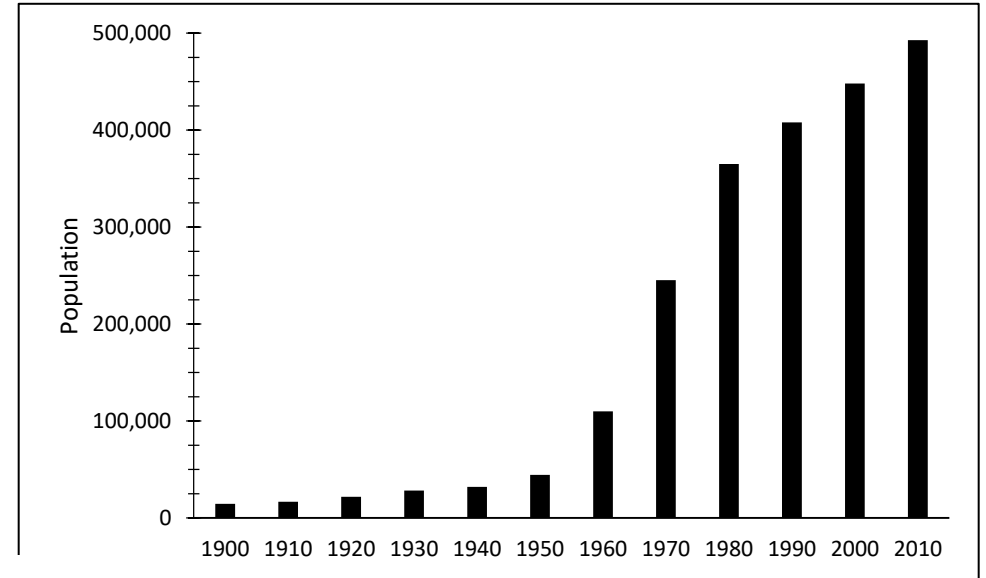
Town of Brookhaven

Home of Stony Brook U.

Largest Town in NYS (area)

Chartered in 1655

Post-WWII suburban expansion



Town of Brookhaven waste management

Municipal collection program (est. 1989)

Curbside recycling phased-in 1989-1990

In 2018: 35 waste districts

no villages, no apartments, condos, co-ops

~120,000 stops (~375,000 residents)

2x/wk MSW (→ Hempstead WTE)

single stream 1x week recyclables (→ Town MRF)

21x/yr yard waste (→ LI Compost)



Zero tip fee, distinctive trucks (capture all targeted wastes)

Daily waste generation trends

Collected 2018 daily data, 35 waste districts (~3300 data points)

Eliminated holiday weeks (missed collection days)

Applied HH, days-between-collection to tonnages

Compared M/T to Th/F collections (lbs/HH/d)

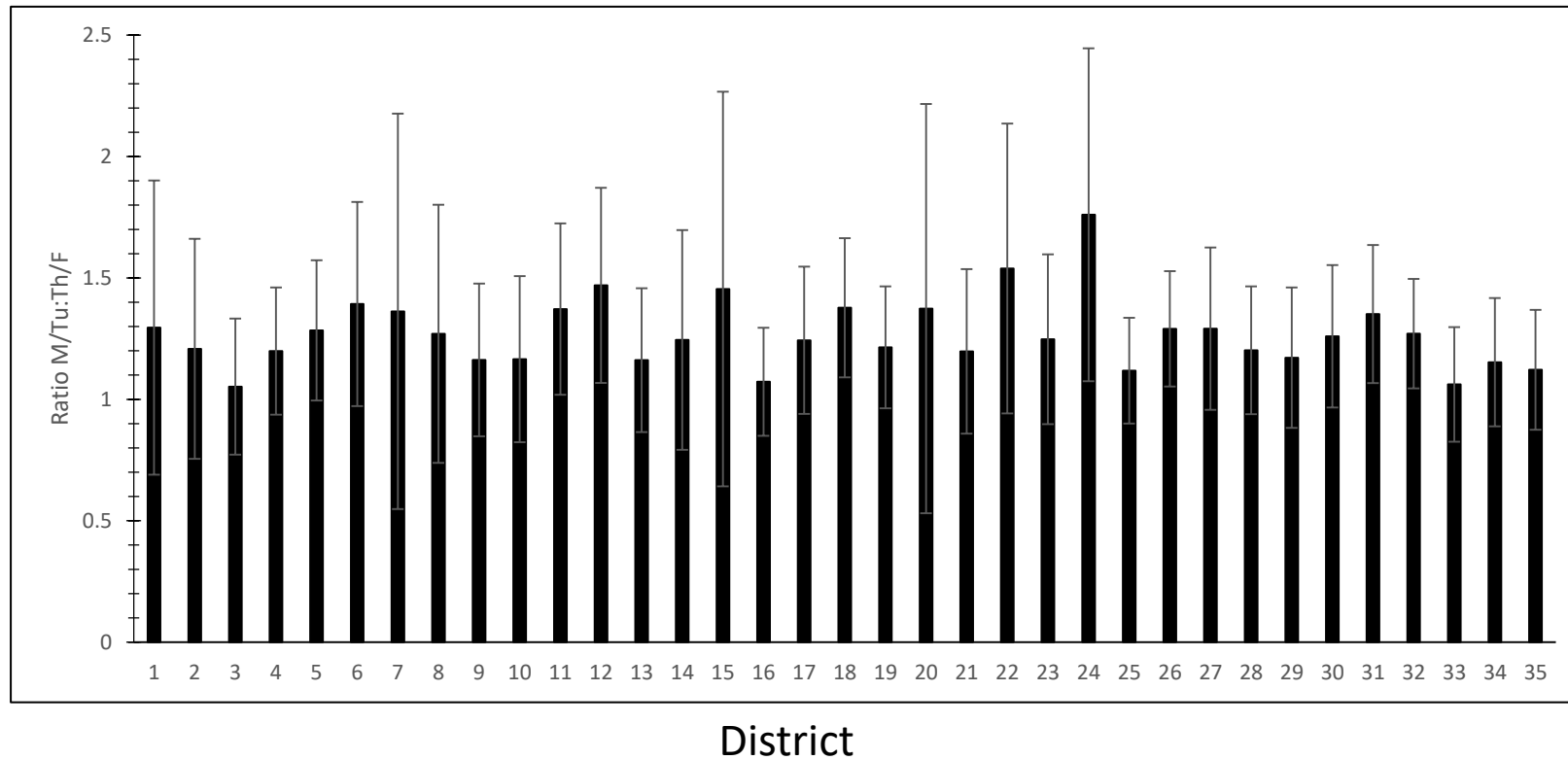
Should be 1:1

but all garbage folk know weekend (M/T) heavier than Th/F

(note weekend 4 days; weekdays 3 days)

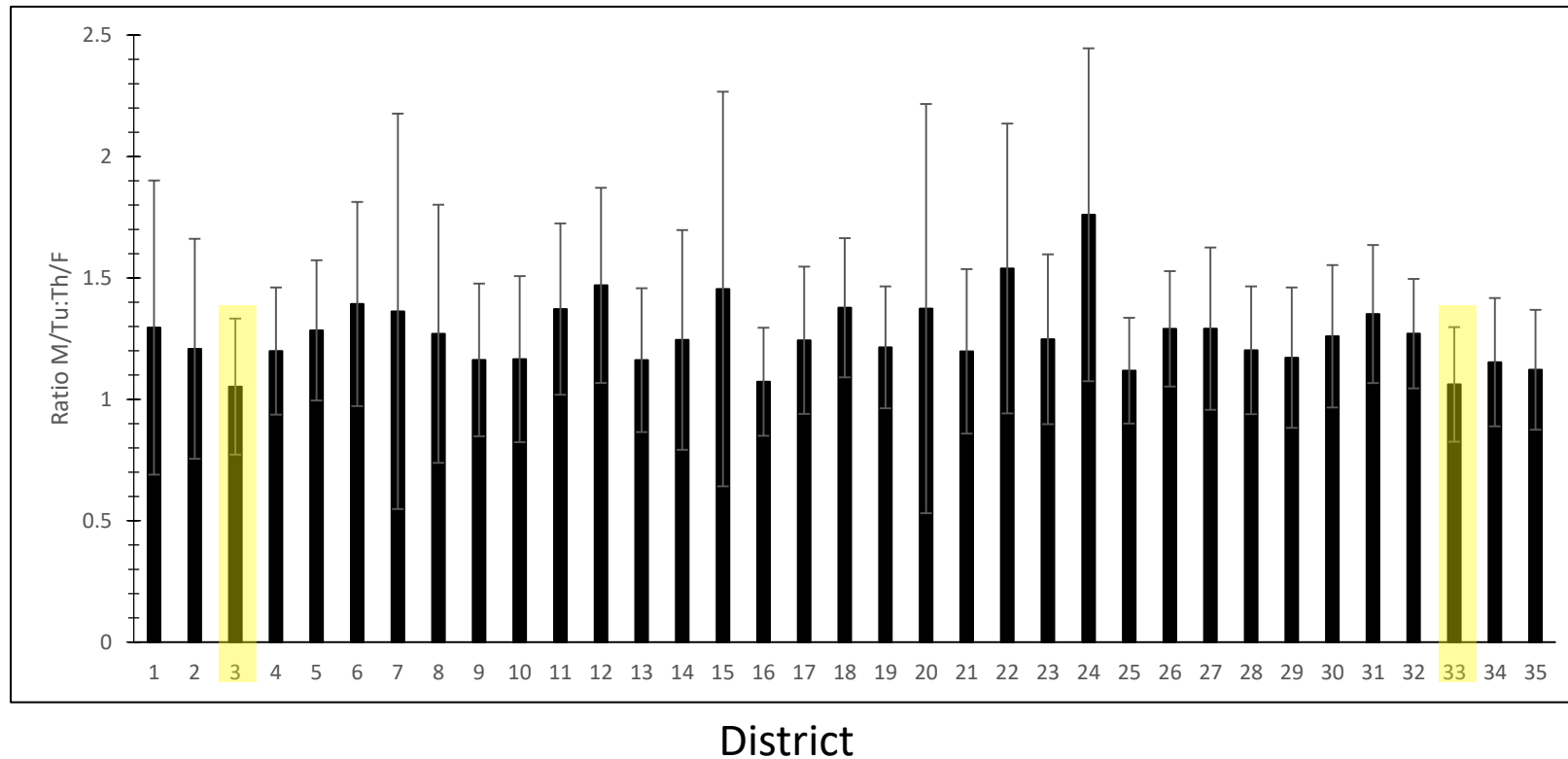


Daily waste generation trends



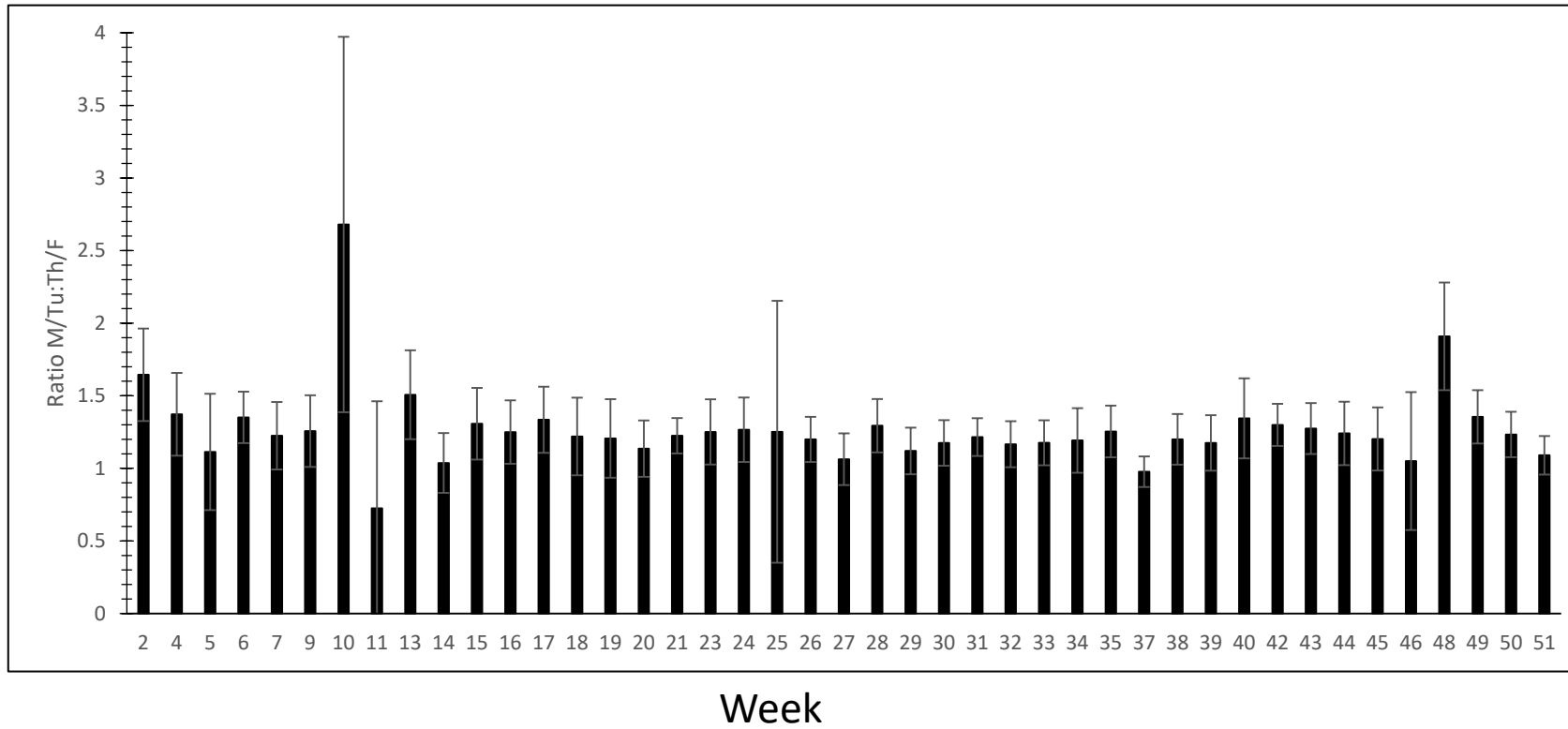
All significant $p < 0.05$ except Districts 3 & 33

Daily waste generation trends

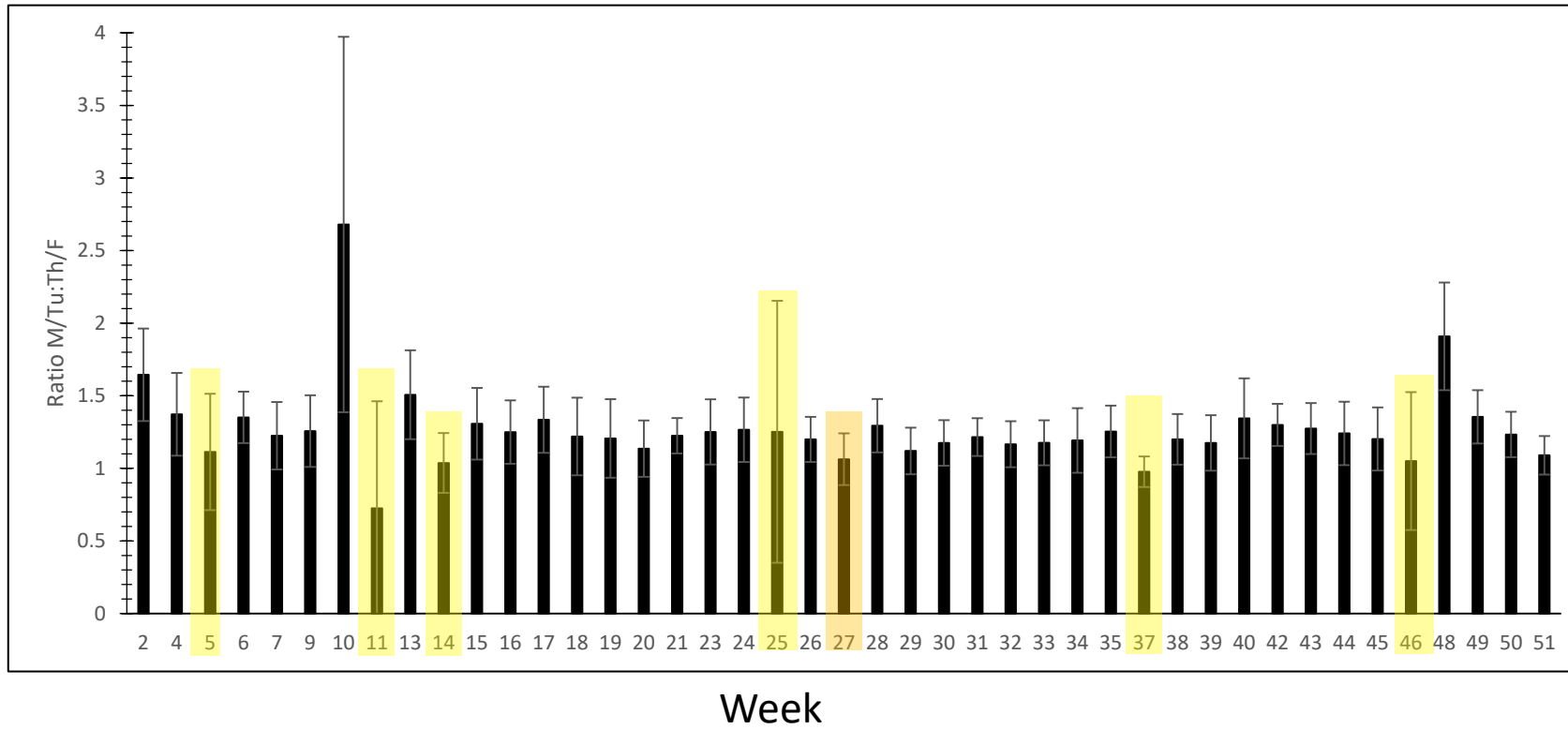


All significant $p < 0.05$ except Districts 3 & 33

Remove "snow week" (week 11): District 33 significant; District 3 significant two-tailed test



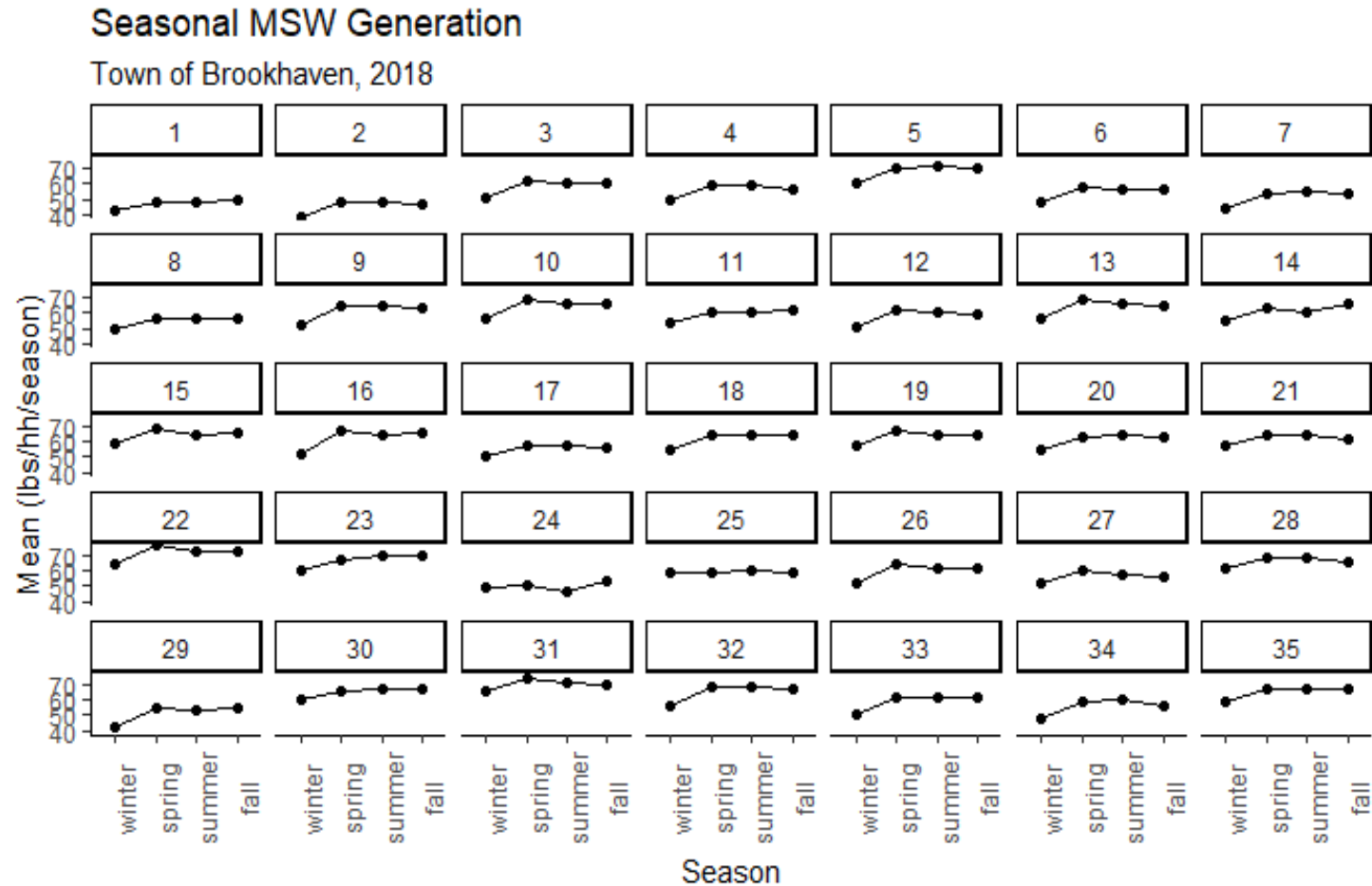
Significant $p < 0.05$ except Week 5, 11, 14, 25, 37, 46; week 27 marginally significant



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Week	Th/Fr heavier than prior-past weeks	M/Tu lighter than prior-past week
5		-15% to -20%
11		7 0s for M/Tu (snow Tu)
14	+10% to 15%	
25	High variability (large std. dev.)	
27	+~10%	
37	+10% to +15%	
46		-15% to -45%

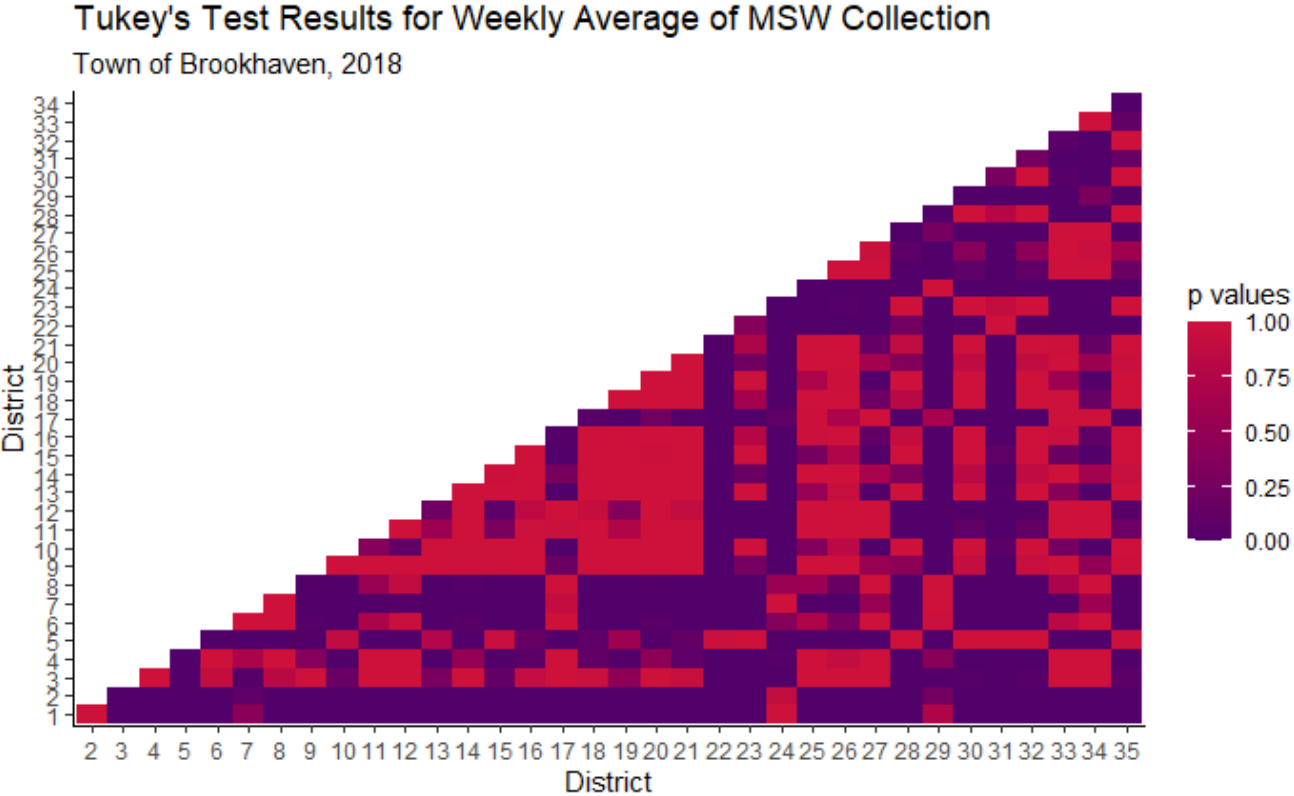
Seasonal trends (weekly generation rates)



Visual difference (winter→other seasons) but significant $p < 0.05$ for 10/35 districts

Districts 9, 10, 16, 18, 20, 26, 29, 32, 33, 34

Geographic differences

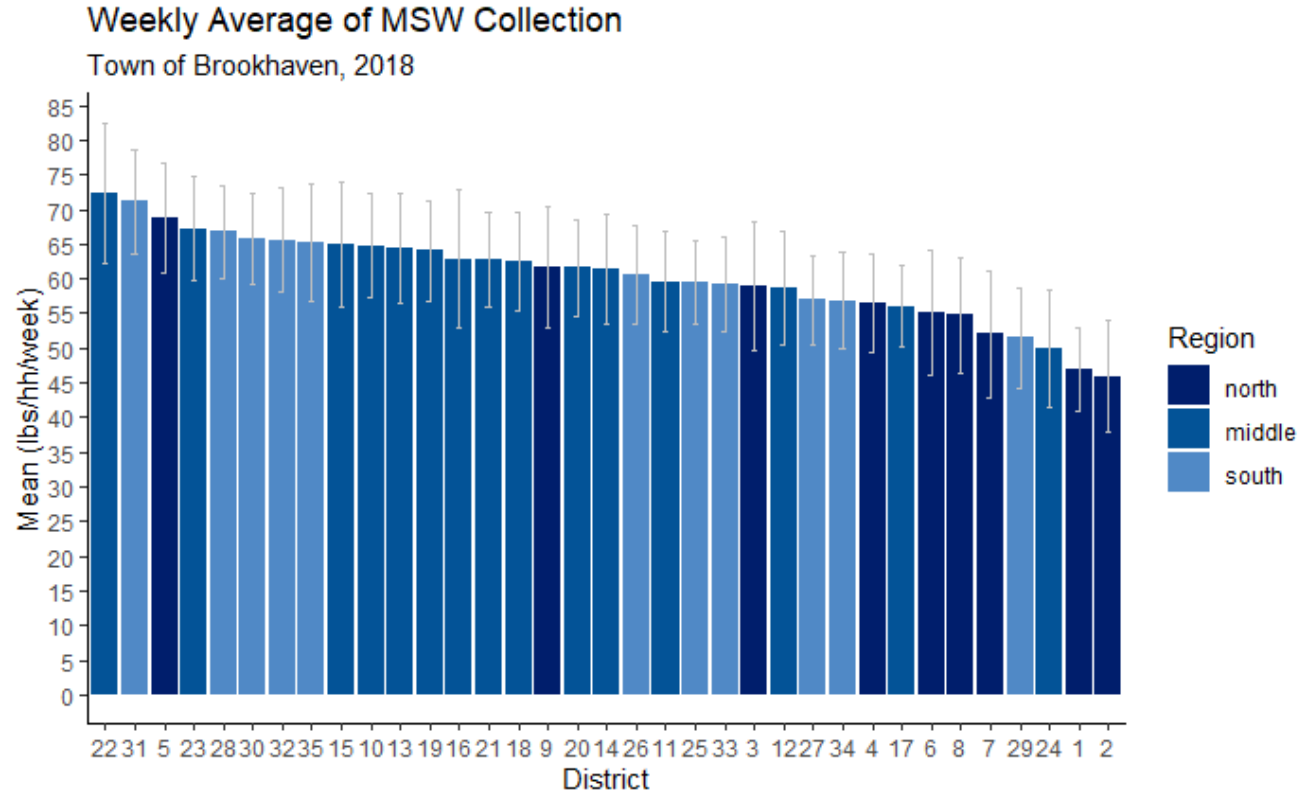


Expected number of significant results: 30 (595 comparisons) (i.e., 5%)

Actual number: 281

Significant @ $p < 0.001$

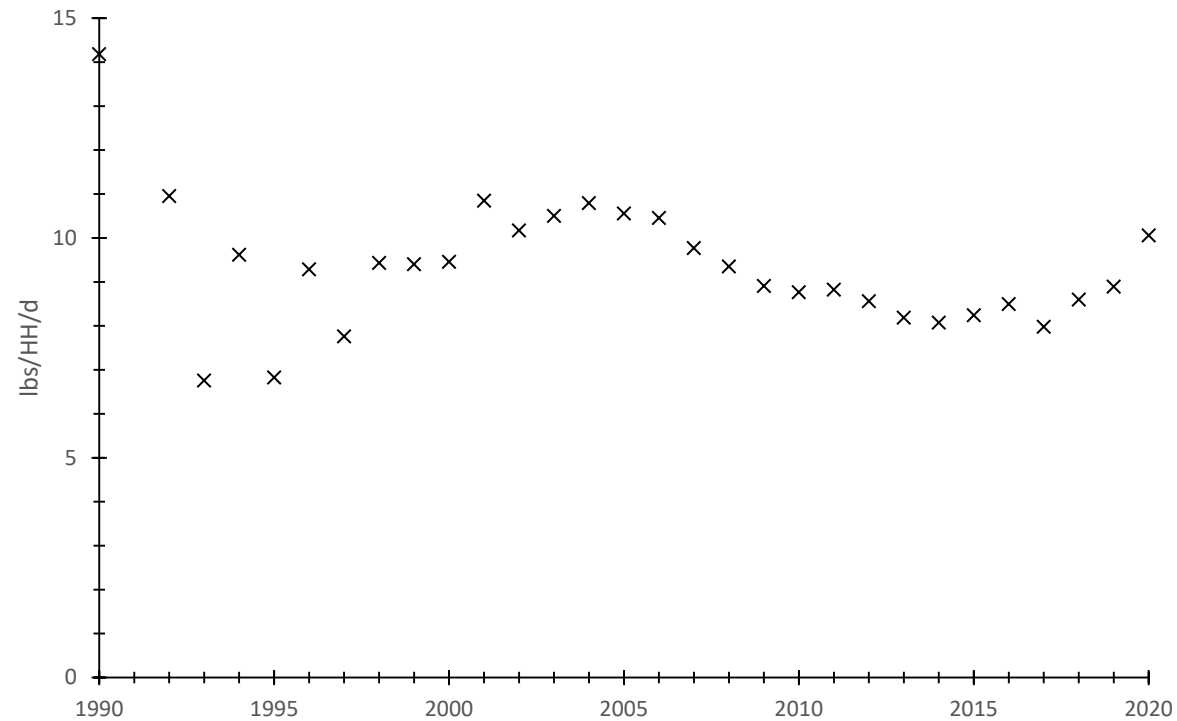
Geographic differences



North significantly different from south ($p < 0.05$) but not middle ($p = 0.07$)

Middle & south not very different

Annual trends



Trend 2004-2017: -26% (significant $p < 0.001$)

-22% tonnage decrease

Trend 2004-2020: <7% decrease (significant $p < 0.01$)

(Δ recycling pgm. 2019, +15% 2020 pandemic)

Waste generation conclusions: the obvious

Residential waste generation rates in Town of Brookhaven vary:

daily

seasonally (a little)

across short distances

annually

been trending down (*pandemic! Exception?)

Data relatively clean – should be generalizable

Brookhaven waste declines

Per capita change 2004-2017: -26%

why?

Waste minimization important government policy objective

Legislation:

Yard waste bans-Let It Lie programs

various materials bans (electronics, Styrofoam, plastic bags
...)

Education-outreach

Cooperative programs with manufacturers

Yard waste a factor?

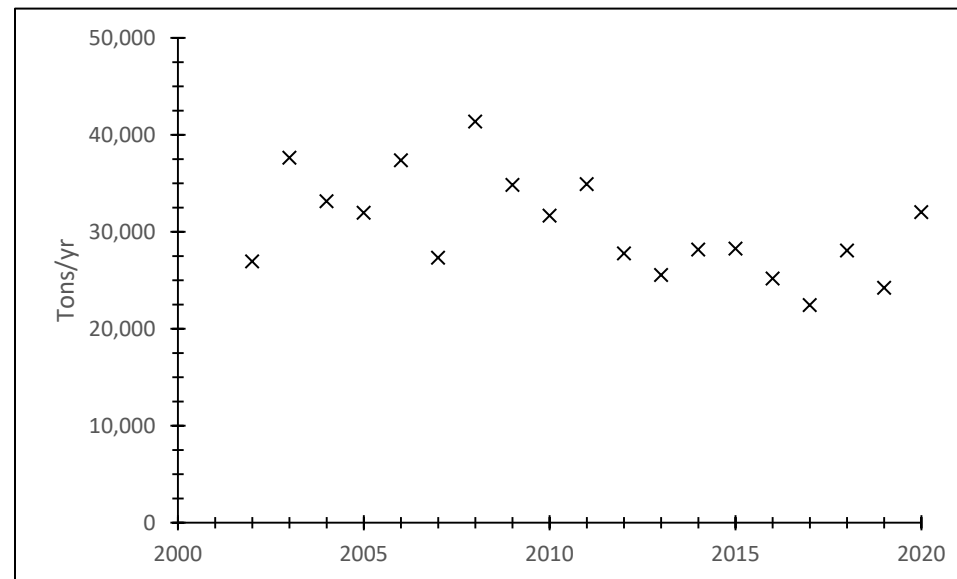
Yard waste ~15% total USEPA waste stream

commercial & residential (but res. more important)

But Brookhaven banned grass clippings ~1995

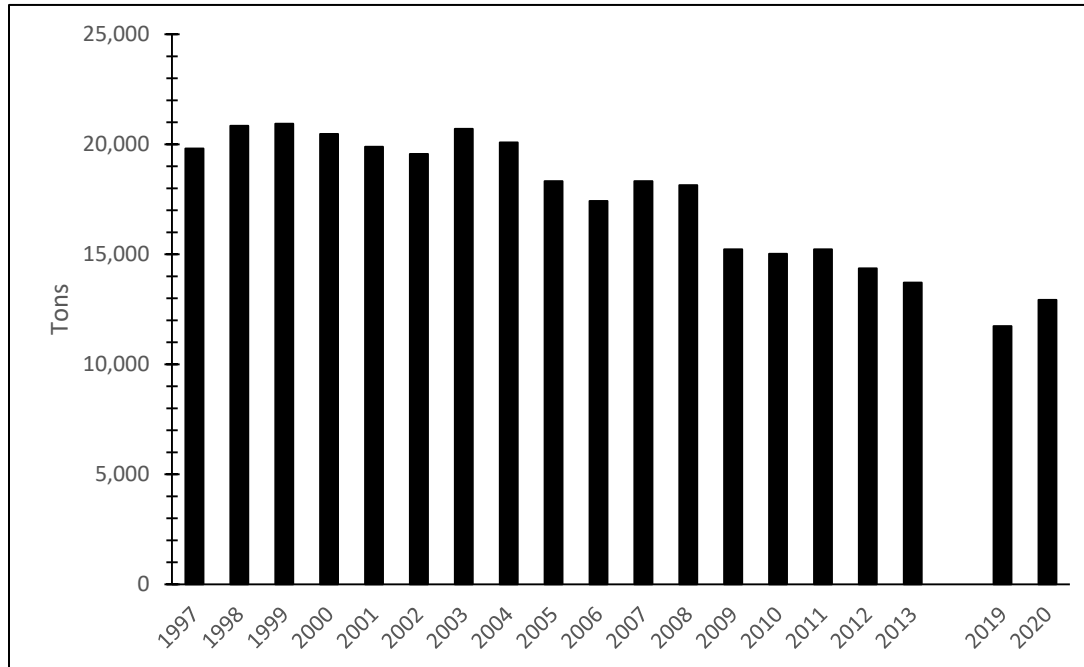
Instituted separate YW collection ~1998

2004-2017 collection trend negative (significant $p < 0.05$)



Other factors

Smart phone impacts to newspaper, printed paper industries



Trend 2004-2020 paper recyclables curbside collection: -41% (significant $p < 0.001$)

offsets for increasing OCC

(containers collection slightly increasing 2004-2013)

Other factors, con't

Plastics substituted for glass & metal

Packaging:product ratio

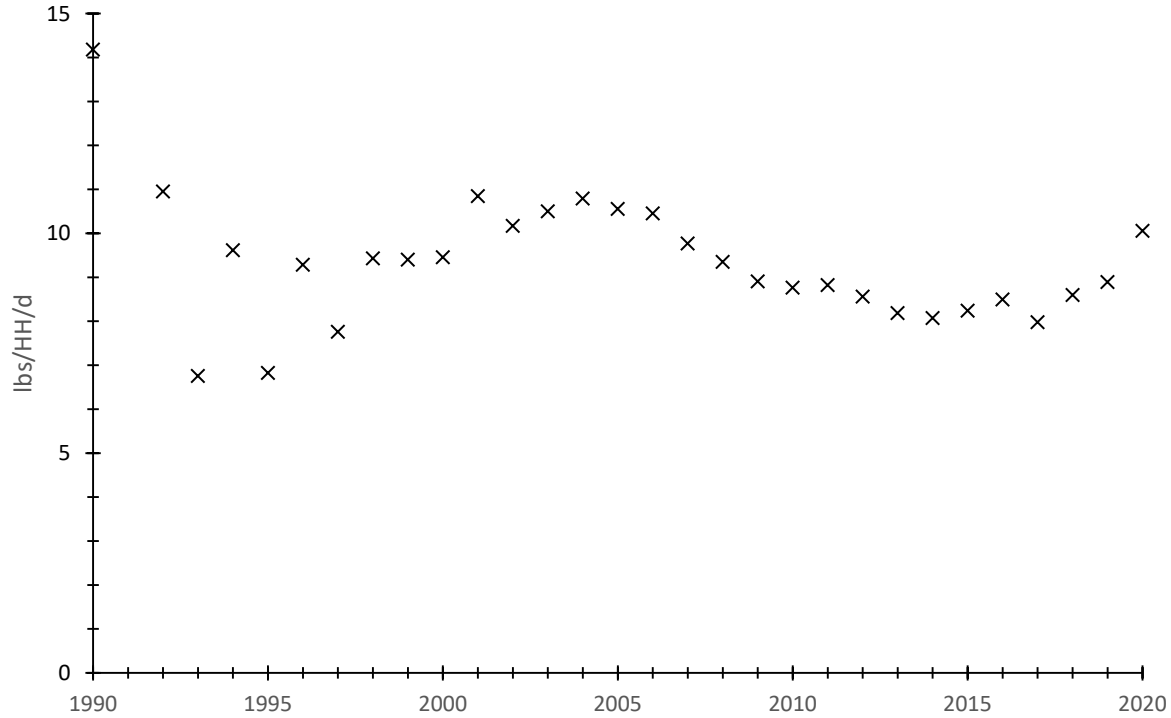
1:1 plastics 1:30, aluminum 1:20, steel 1:8, glass

Plastics lightweighting, too

Note: paper-plastic effects not legislated
instead, social/economic causes

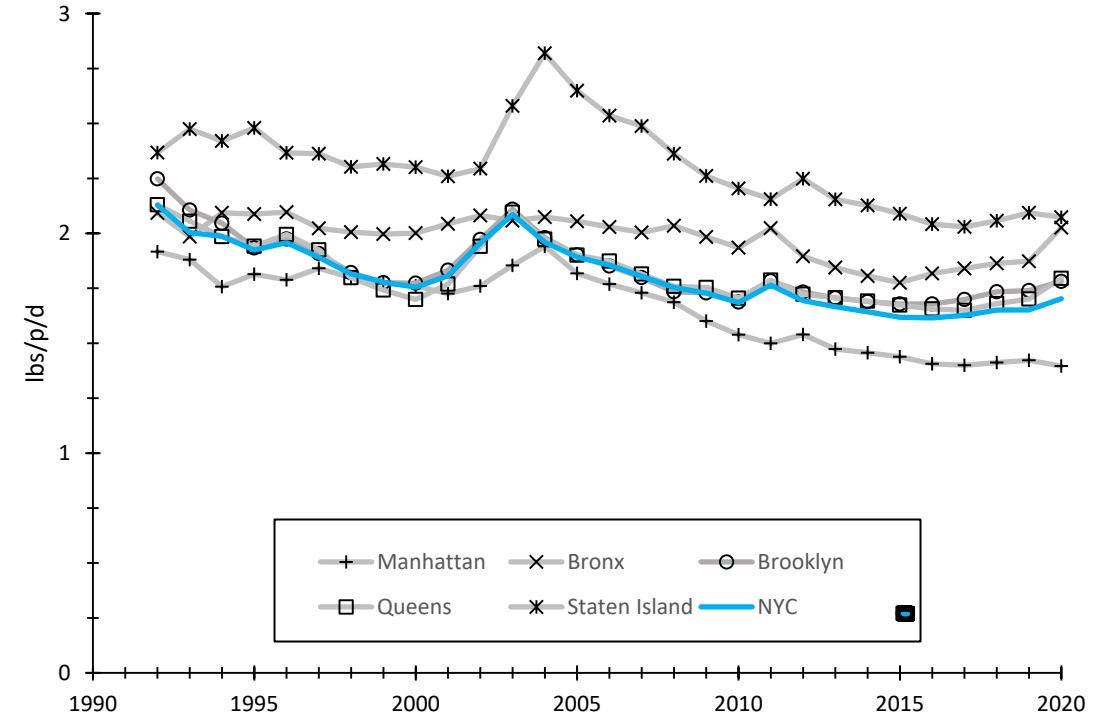


Not just in Brookhaven



Brookhaven 2004-2017: -26% (significant $p < 0.001$)

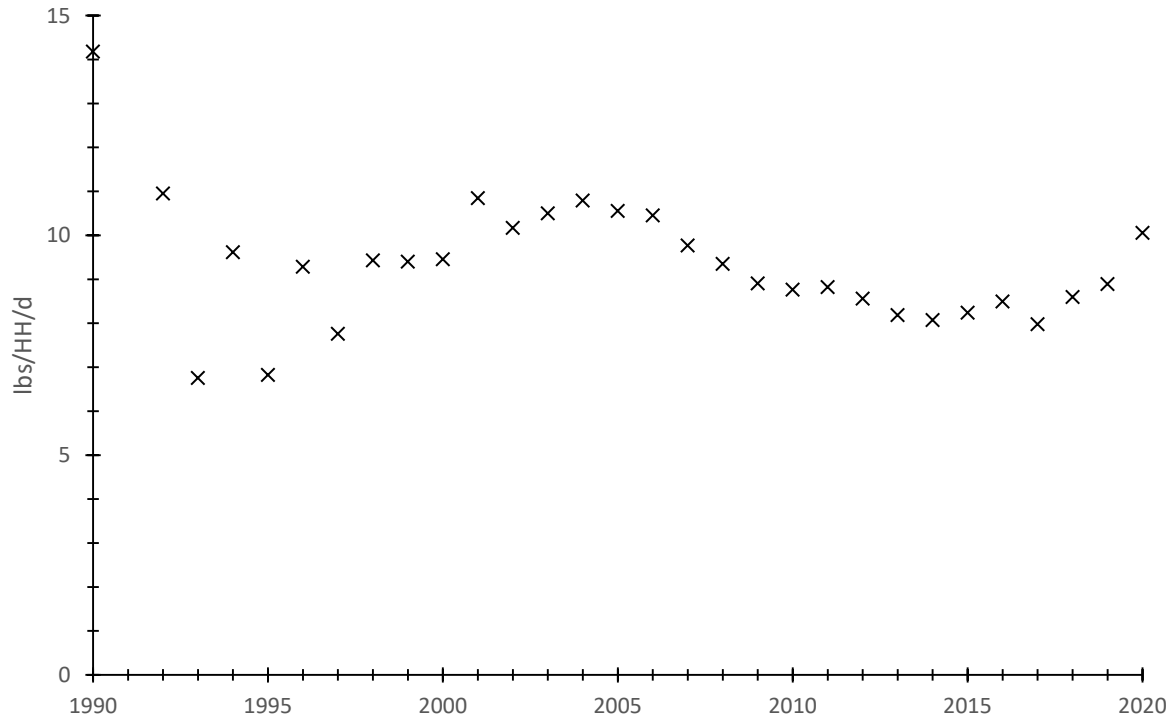
-22% tonnage decrease



NYC (overall) 2004-2017: -19% (significant $p < 0.001$)

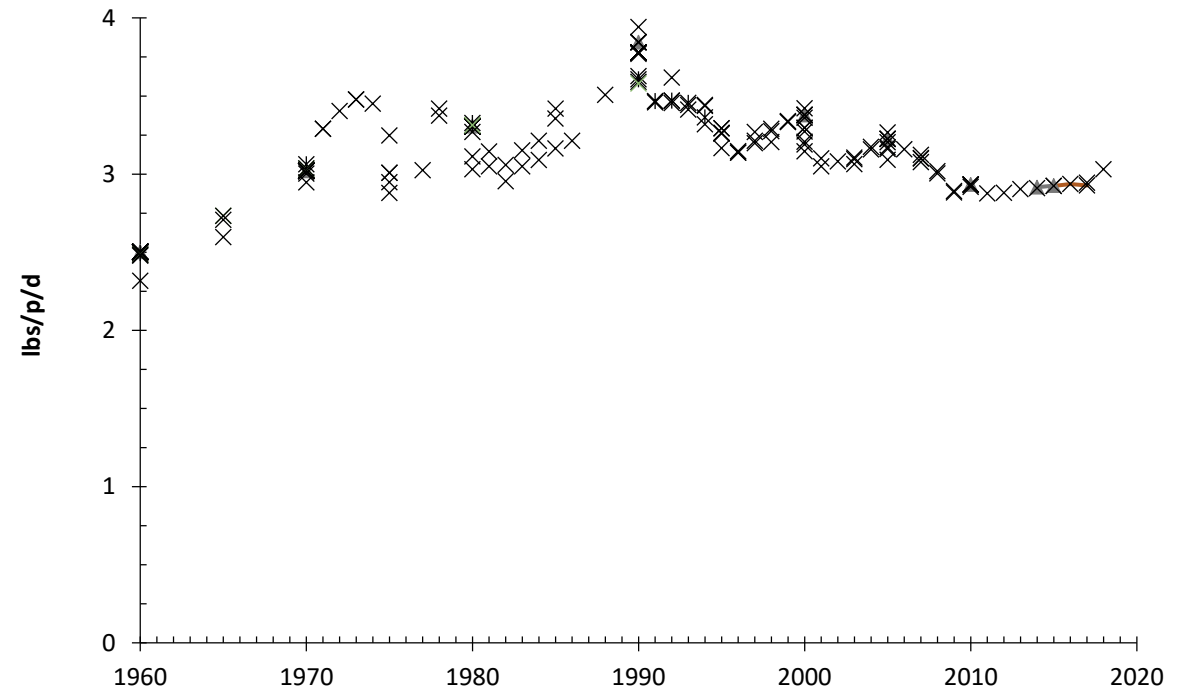
-15% tonnage decrease

Not all data sources agree



Brookhaven 2004-2017: -26% (significant $p < 0.001$)

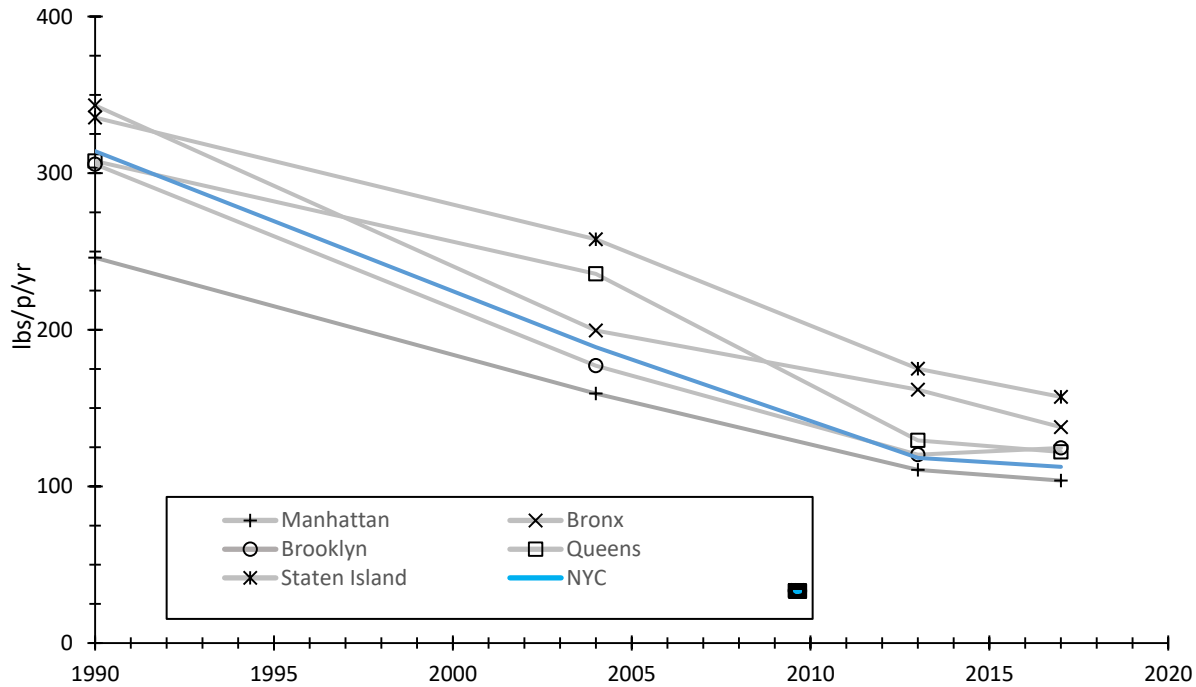
-22% tonnage decrease



USEPA model 2004-2017: -7% (significant $p < 0.01$)

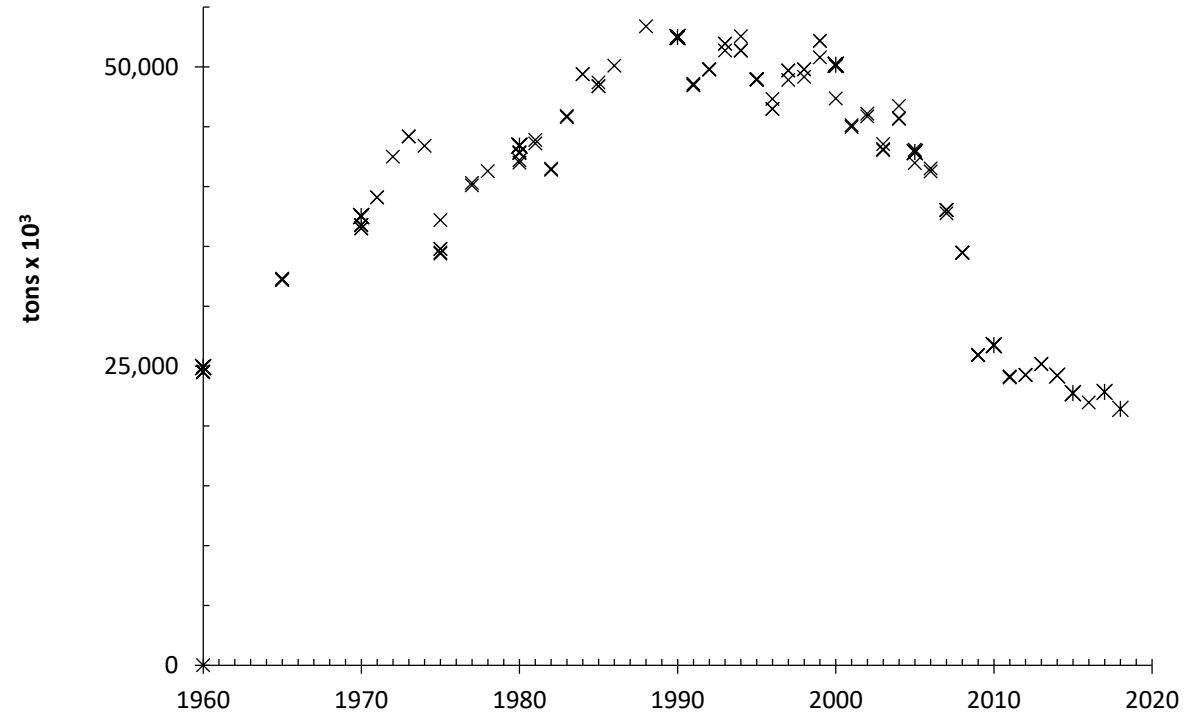
-3% tonnage decrease

But: paper in disposed wastes



NYC (overall): 2004-2017: -48%

1990-2017 trend significant $p < 0.05$



USEPA model: 2004-2017: -50%

Trend significant $p < 0.001$

Conclusions

Residential waste generation rates vary:

daily

seasonally (a little)

across short distances

annually

Residential waste generation rates: trending down.

Technology (smartphone, lighter packaging) probable cause of long-term trend

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