VBNs, Tax Sale, and Homicides

Purpose

The goal of this data analysis is to explore the relationship in Baltimore City, Maryland, between the presence of properties with vacant building notices, properties whose liens were auctioned as part of the tax sale, and the number of homicides in the nearby vicinity.

Methodology

The following datasets were used:

- Real Property Information, downloaded from Baltimore Open Data on 3/22/22
- Open Vacant Building Notices, provided by the SOS Fund on 2/23/22
- 2022 Tax Sale List, provided by Fight Blight Bmore on 4/15/22
- 2021 Homicides, provided by the SOS Fund on 2/23/22

The logical way of connecting the four datasets is with Block and Lot, as every piece of property in Baltimore City is assigned a unique set (note that this is different from what most Baltimore residents refer to as a block). The first three datasets, being property data, already contain Block and Lot. 2021 Homicides do not, and the addresses were not exact (the City block, i.e. 2500 Wabash Ave, not 2515). However, each homicide entry contains a specific longitude and latitude. So a free online reverse geocoder was used to assign each homicide a specific address. In the frequent case of homicides occurring outside of a building, the address was that of the closest address. Then the Real Property dataset was used as a lookup (with some manual assignment in special cases) to assign each homicide a Block and Lot.

With this completed, the Real Property dataset was used as the foundation, joining the other three datasets to it. Every unique property in the City was assigned a column containing “Yes” or “No” as to whether it 1) Had a Vacant Building Notice (VBN), 2) Was on the Tax Sale list, and 3) Whether a homicide occurred at or adjacent to it.

Next, the Real Property dataset was summarized by Block, indicating the number of properties with VBNs, tax sale properties, and homicides. To simplify further, the Blocks were summarized in two ways: 1) Yes-No, and 2) Number Grouping (see spreadsheet tabs with these names). The final step was trying to quantify the relationship between VBNs, tax sale properties, and homicides by running regression on the raw numbers.

Results

Table 1

Number of Blocks with a Homicide		Any Properties with VBNs	
		No	Yes
Any Properties on Tax Sale List	No	30	4
	Yes	50	211

Table 2

Number of Blocks TOTAL		Any Properties with VBNs: No	Any Properties with VBNs: Yes
Any Properties on Tax Sale List	No	1777	239
	Yes	1514	2023

Table 3

% Likelihood of Homicide on Block in 2021		Any Properties with VBNs: No	Any Properties with VBNs: Yes
Any Properties on Tax Sale List	No	1.7%	1.7%
	Yes	3.3%	10.4%

There are a total of 5553 Blocks in Baltimore City, and 295 Blocks with at least one homicide on them in 2021. For brevity we will refer to Blocks with at least one vacant building notice as VBN Blocks, and Blocks with at least one property on the Tax Sale list as TS Blocks. Blocks with both will be referred to as VBN-TS Blocks, and Blocks without any VBNs or tax sale properties will be Base Blocks.

Table 1 shows there are a lot of VBN-TS Blocks with homicides in 2021. By looking at Table 2 we can see that, although VBN-TS Blocks make up 36.4% of all Blocks in the City (2023/5553), they make up 71.5% of all Blocks with homicides (211/295). And, while Base Blocks make up 32.0% of City Blocks (1777/5553), they make up only 10.2% of Blocks with homicides (30/295)

Table 3 normalizes this data by looking at the likelihood of a homicide being committed at least once on a Block, based on whether it's a Base, VBN, TS, or VBN-TS Block. A VBN-TS Block had a 10.4% chance of a homicide being committed on it at least once in 2021. Compared with Base Blocks, TS Blocks are twice as likely to have a homicide. This increase becomes even more pronounced on VBN-TS Blocks, which are 6x more likely. Curiously there is no difference in likelihood between Base and VBN Blocks. It's not immediately clear why this is, since the vast majority (2023/2262, or 89%) of Blocks with a VBN also have at least one tax sale property.

Table 4

Number of Unique Blocks with Homicides		# Properties with VBNs: 0	1-4	5-9	10+	**Total**
# Properties on Tax Sale List	0	30	4	0	0	**34**
	1-4	43	52	24	13	**132**
	5-9	4	13	16	29	**62**
	10+	3	4	5	55	**67**
	Total	**80**	**73**	**45**	**97**	**295**

Table 5

Number of Unique Blocks TOTAL		# Properties with VBNs				
		0	1-4	5-9	10+	**Total**
# Properties on Tax Sale List	0	1777	227	6	6	**2016**
	1-4	1397	886	167	57	**2507**
	5-9	93	223	161	198	**675**
	10+	24	28	41	262	**355**
	Total	**3291**	**1364**	**375**	**523**	**5553**

Table 6

% Likelihood of Murder on Block		# Properties with VBNs				
		0	1-4	5-9	10+	**Total**
# Properties on Tax Sale List	0	1.7%	1.8%	*	*	**1.7%**
	1-4	3.1%	5.9%	14.4%	22.8%	**5.3%**
	5-9	4.3%	5.8%	9.9%	14.6%	**9.2%**
	10+	12.5%	14.3%	12.2%	21.0%	**18.9%**
	Total	**2.4%**	**5.4%**	**12.0%**	**18.5%**	**5.3%**

**Not calculating due to low sample size*

The results from Tables 1, 2, and 3 become even more pronounced when we group by the number of VBNs or tax sale properties instead of a binary yes or no. The more properties on a Block that were on the tax sale list, the higher likelihood of a homicide being committed. This correlation held true for the number of VBNs on a Block as well. Of note is the interaction between more VBNs and more tax sale properties. While Base Blocks had a 1.7% chance of a homicide, Blocks with 10 or more VBNs and 10 or more tax sale properties were 12x more likely to have at least one homicide, at a whopping 21.0%.

Below are the results of the regression, with the following variables. Independent: 1) Count of VBNS, 2) Count of tax sale properties, 3) A binary indicator of whether or not there are zero VBNs and zero tax sale properties. And a binary indicator of whether a homicide was committed during 2021 as the dependent variable.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.224474
R Square	0.050389
Adjusted R Square	0.049875
Standard Error	0.218637
Observations	5553

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	14.07498	4.691659	98.14774	6.73E-62
Residual	5549	265.2533	0.047802		
Total	5552	279.3283			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.034374	0.004564	7.53168	5.81E-14	0.025427	0.043321	0.025427	0.043321
VBN Count	0.005296	0.000672	7.880807	3.89E-15	0.003979	0.006614	0.003979	0.006614
2022 TS Count	0.003763	0.000993	3.791595	0.000151	0.001817	0.005709	0.001817	0.005709
Zero VBN and TS	-0.01749	0.006909	-2.53187	0.011373	-0.03104	-0.00395	-0.03104	-0.00395

The P-value for the intercept and the three independent variables is all below 0.05, indicating that there is a strong correlation between the number of VBNs and tax sale properties on the number of homicides. Using the coefficients, the existence of any VBNs or tax sale properties increases the likelihood by 1.75 percentage points, each additional VBN increases the likelihood by 0.53 percentage points, and each additional tax sale property increases the likelihood by 0.38 percentage points.

It should be mentioned, although the R-square is only 5%, which means that only about 5% of the variation between Blocks can be described by the presence and number of VBNs and tax sale properties. Thus, while they make a clear impact on the likelihood of a homicide being committed on a Block, there are many other factors that influence this.

Conclusions

In summary, there is a strong correlation between the presence of vacant building notices and tax sale properties with homicides committed on that Block. This impact is especially clear with higher numbers of VBNs and tax sale properties.

Recommendations for Further Analysis

Given that the way most Baltimoreans experience their “block” is different than how a Block in this analysis is defined, it would be worthwhile to do this same analysis but through that lived definition (i.e. 2500 block of Wabash). This would require a lot of manual assigning of lots to a particular block.

Additionally, a spatial analysis of distance between VBNs and tax sale properties from homicide locations could be conducted to examine this relationship further.

Lastly, given that only 5% of the variation between Blocks in this analysis is explained by the presence of VBNs and tax sale properties, other factors could be added into this analysis such as neighborhood demographics, property tax assessments, whether a Block is mostly residential, commercial, etc. This would be a trial and error process of adding in variables to test their impact.