Rise in Temporary Detention Orders in Virginia, 2013-2017: Possible Contributing Factors*

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Summary

From 2013 through 2017, there has been a substantial increase in temporary detention orders (TDO) in Virginia. State hospitals are absorbing an increasing number of these patients. This report explores various theories put forth to explain the increase in temporary detention orders in general. Factors that appear to have contributed to the increase in temporary detention orders in general include attention to the death of Austin Deeds, the implementation of the Governor's Access Plan, and the opening of increasing numbers of crisis intervention team assessment centers, although other factors may have had subtle effects as well.

Contents

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I. Introduction

In Virginia, when a magistrate determines that there is probable cause to believe that a person with mental illness poses a risk to himself or others, the magistrate can issue a temporary detention order (TDO) allowing the person to be held against his will for up to 72 hours (or more on a weekend) pending a commitment hearing. In recent years, the number of TDOs issued has been increasing. This is a concern from a number of standpoints, including the civil liberty of persons detained, the pressure on hospital capacity, the added cost of hospitalization, and the apparent gaps in availability of community services to reduce the need for hospitalization in such cases. This report utilizes data from several sources to explore the possible reasons for the recent increase in TDOs and the possible implications for mental health law reform in the Commonwealth.

A. Data Sources

Most of the data were provided by the Department of Behavioral Health and Developmental Services (DBHDS). Data on Medicaid reimbursements were obtained from the Community Consumer Submission 3 (CCS3) database. Internal DBHDS datasets created for other purposes were also used. The data on overall numbers of TDOs were provided by the Supreme Court of Virginia. Data on CIT-trained officers was provided by the Virginia Compensation Board.

B. TDO Process

A person experiencing a mental health crisis may be taken into custody and brought to an appropriate location for an emergency assessment by a trained CSB emergency services clinician. If the CSB "prescreener" determines that the person poses an active threat to self or others, or that the person lacks the ability to care for themselves, and the evaluee does not agree to inpatient treatment, the prescreener may contact a magistrate to request that a TDO be issued. Once a temporary detention order is issued, the person is taken to a secure psychiatric facility for up to 72 hours, although that time can be extended if the end of the 72-hour period falls on a weekend or holiday. At some point during that period, a commitment hearing must be held. There are four possible outcomes of the hearing: (1) the person may be involuntarily committed for up to 30 days; (2) the person may agree to voluntary admission; (3) the person may be ordered to participate in outpatient treatment; or (4) the petition may be dismissed and the person discharged.

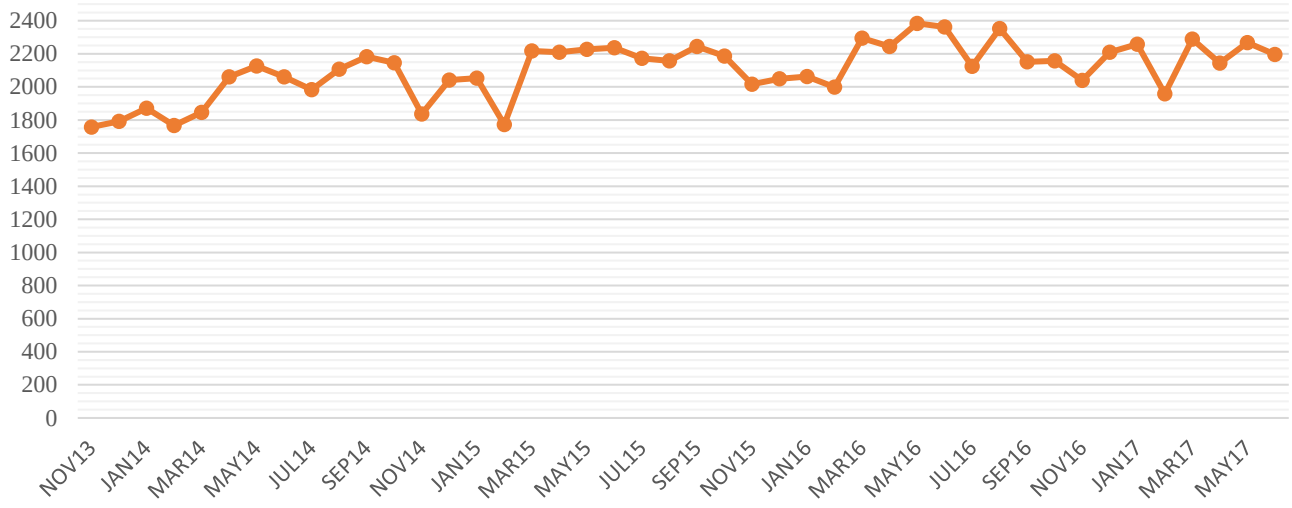
II. The Increase in TDOs

A. Statewide Trends

TDOs have been on the rise since 2013, both statewide and in most regions. Figure 1 shows total TDOs by month. The first major increase appears to have occurred in spring of 2014. TDOs increased by 6.9% in fiscal year (FY) 2014 as compared with FY 2013, while involuntary commitment orders increased even more (10.6%). TDOs increased by 8.2% in FY 2015, as compared with FY 2014, although involuntary commitments barely changed during this period. TDOs increased again (by 4.6%) in 2016, and, in that same period, involuntary commitment orders increased on a similar scale (3.2%). When comparing FY 2017 with FY 2016, TDOs were nearly unchanged, while involuntary commitments increased by 2.0%. Overall, the number of TDOs was 21% higher in FY 2017 than it was in FY 2013.

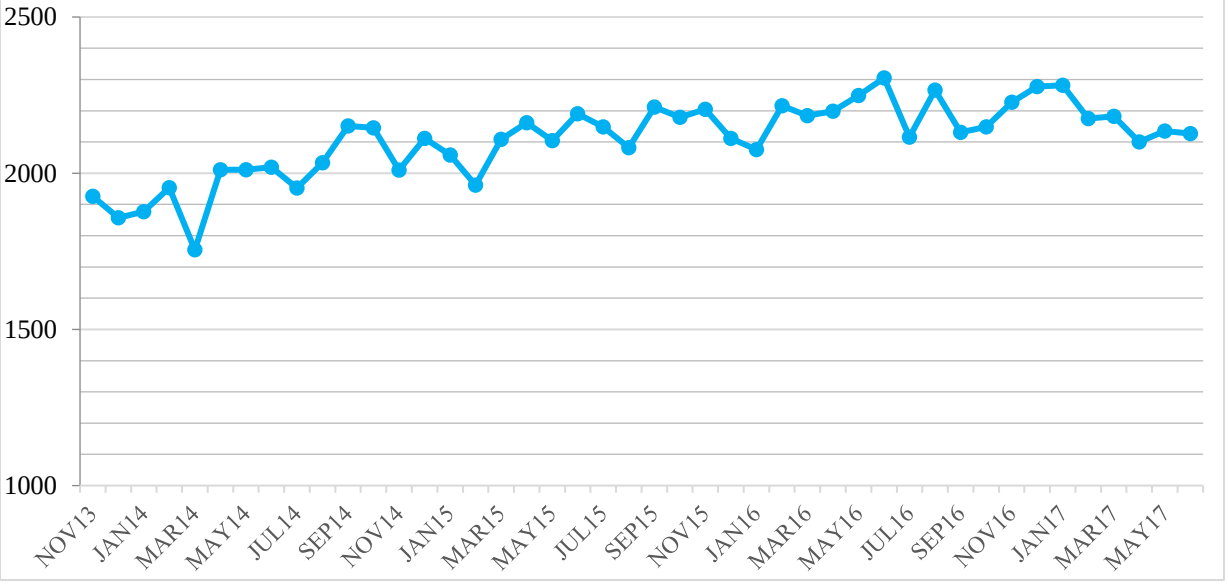
In most years there is a consistent seasonal pattern in which the summer months see the most TDOs and the fall months have the fewest. In order to observe short term changes in TDOs, therefore, it is necessary to adjust for time of year. TDOs from October 2013 to June 2017 were adjusted and observed for short term increases that may indicate a temporal effect. (See the Appendix for a description of how the adjustment was made).

Figure 1: Total TDOs, unadjusted



The DBHDS fiscal year begins on the 1st of July and ends on the 30th of June. Statewide, average adjusted TDOs per month (Figure 2) were significantly higher in the 4th quarter of fiscal year 2014 as compared to the 3rd quarter (t=2.2, df=37, p=0.0227). Adjusted TDOs were also statistically significantly higher in 3rd quarter fiscal year 2015 compared to the 2nd quarter (t=2.41, df=37, p=0.0211). There were more gradual increases between and after those two points. Adjusted TDOs saw a statistically significant decline from 3rd quarter 2017 to the 4th (t=-2.18, df=37, p=0.0356). There was an overall increase across the period from the 2nd quarter of fiscal year 2013, to the fourth quarter of 2017 (t=2.37, df=37, p=0.0229). ***From November 2013 to June 2017 there was a 10% increase in seasonally adjusted TDOs.***

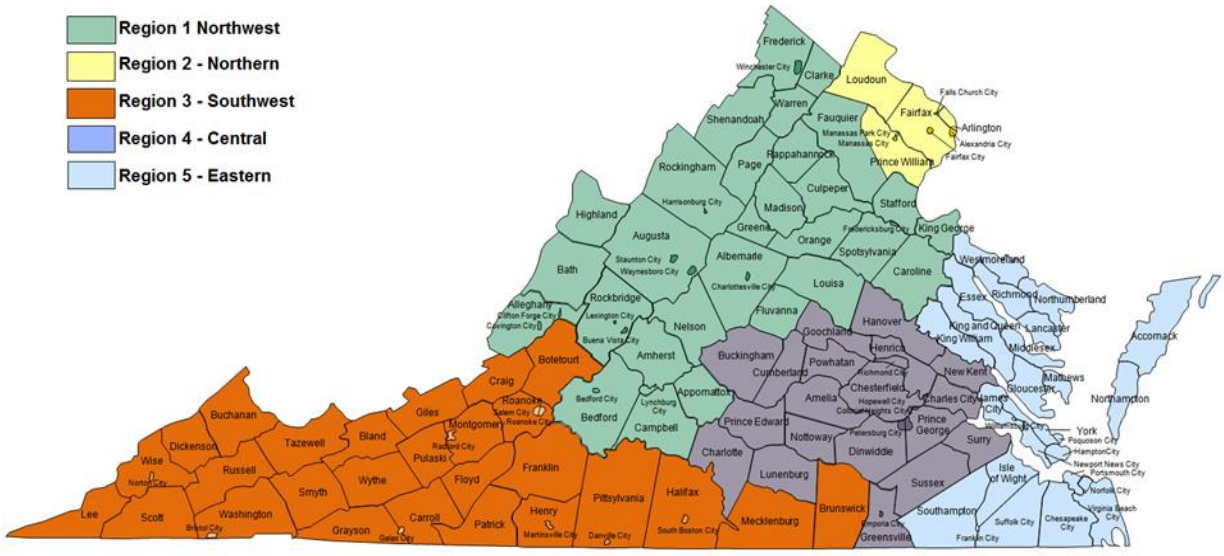
Figure 2: Seasonally Adjusted TDOs



B. Regional Trends in Seasonally Adjusted TDOs

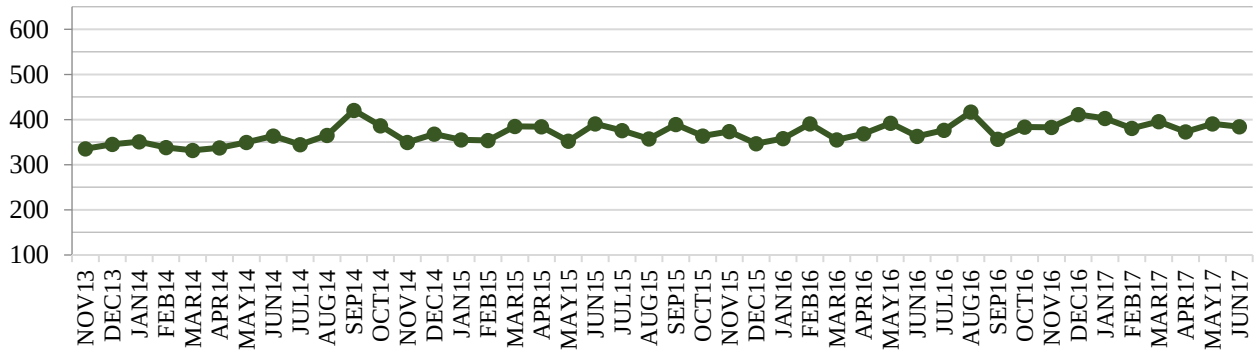
In addition to statewide patterns in seasonally adjusted TDOs, patterns were also observed for each of the five DBHDS regions.

Figure 3: Map of DBHDS Regions[2]



Across the entire period from 2nd quarter 2014 to 4th quarter 2017, there was no permanent, statistically significant change in seasonally adjusted TDOs in **Region 1** (Figure 4).

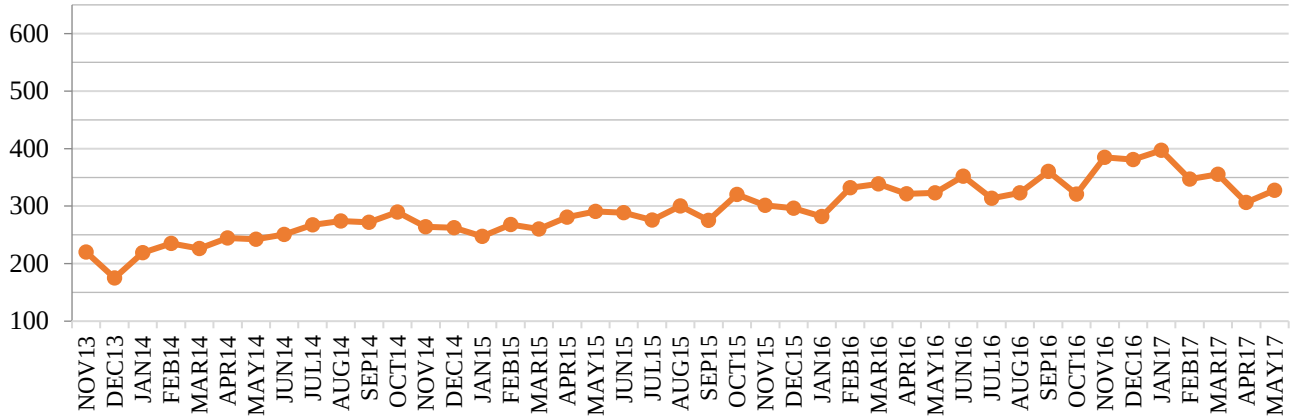
Figure 4: Region 1



Region 2 showed a substantial increase for most quarters following the 2nd quarter of 2014 up through the 3rd quarter of 2016 (Figure 5). There was also an increase in the 2nd quarter of 2017, although there was a decline in the last quarter of that same year. Overall, across the

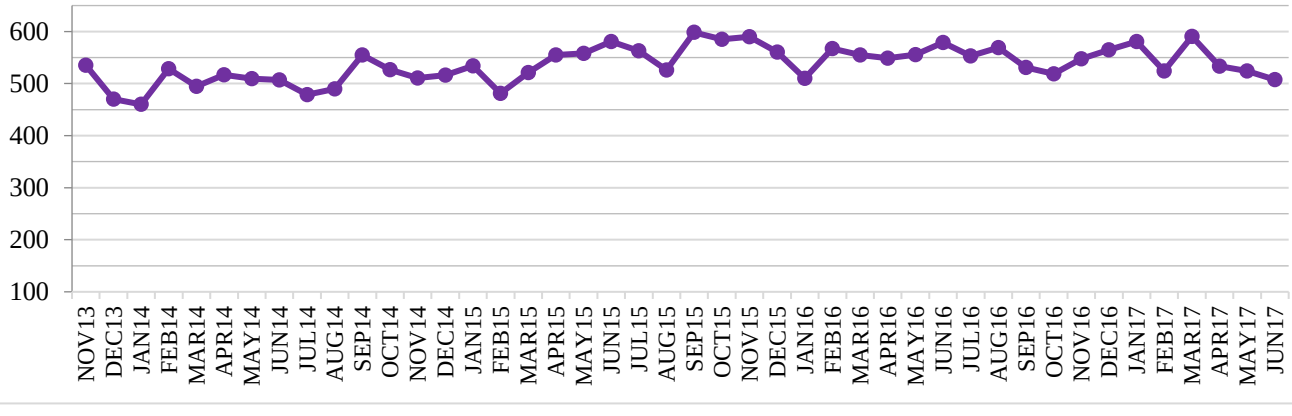
period, there was a dramatic increase in adjusted TDOs. The increase from November 2013 to June 2017 was 42%.

Figure 5: Region 2



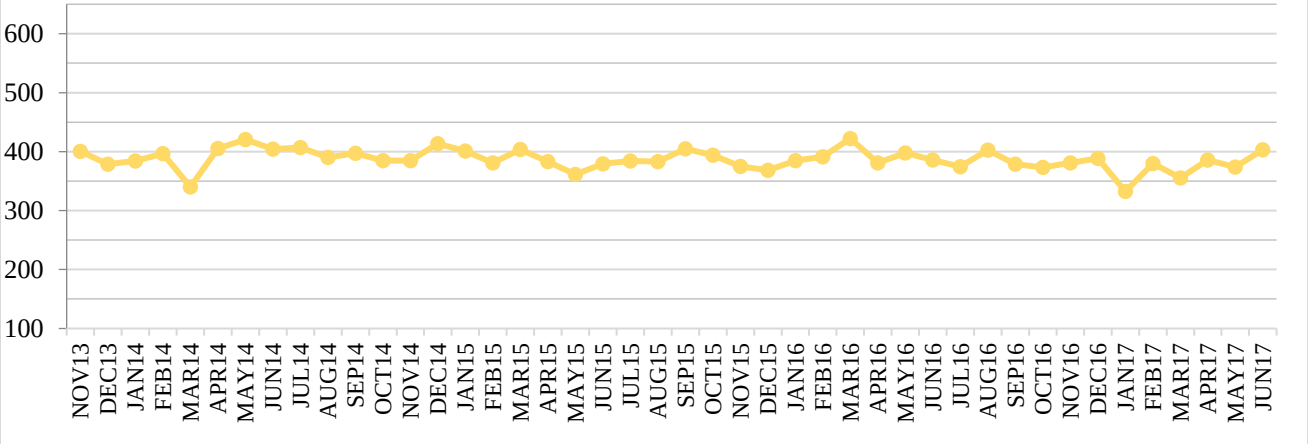
Across the entire period from 2nd quarter 2014 to 4th quarter 2017, there was no permanent, statistically significant change in seasonally adjusted TDOs in **Region 3** (Figure 6).

Figure 6: Region 3



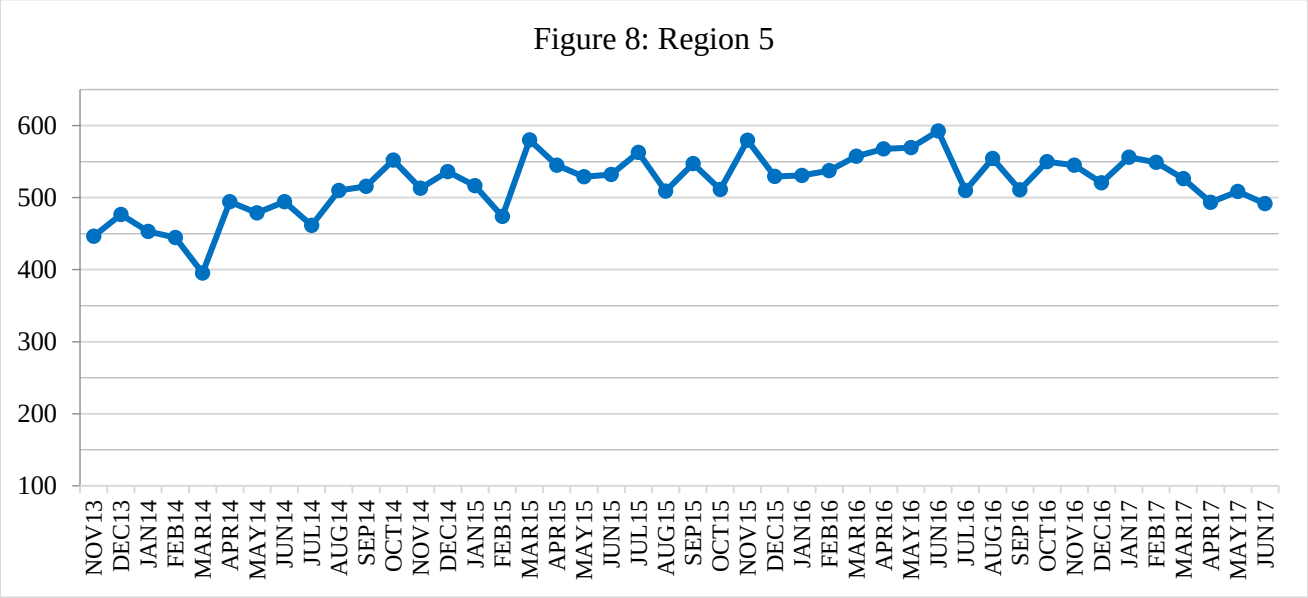
Across the entire period from 2nd quarter 2014 to 4th quarter 2017, there was no permanent, statistically significant change in seasonally adjusted TDOs in **Region 4** (Figure 7).

Figure 7: Region 4



Across the entire period from 2nd quarter 2014 to 4th quarter 2017, there was no permanent, statistically significant change in seasonally adjusted TDOs in **Region 5** (Figure 8).

Figure 8: Region 5



In comparing regional trends to the statewide trend, 57% of the statewide increase in TDOs were from Region 2, 25% were from Region 1, 16% were from Region 3 and 5% were from Region 5. Regions 1 and 2 clearly had the greatest difficulty with rising TDOs, especially Region 2. Efforts to respond to this problem might focus on the Northern part of the state.

III. Trends in Evaluations and Their Outcomes

There are three possible mechanisms for an increase in TDOs. An increase in the number of people experiencing mental health crises, (or in the reporting of crises) can lead to more people being evaluated. An increase in the level of acuity among people experiencing crises can lead to a greater proportion of evaluations resulting in TDO. Finally, even if the number and clinical profile of crisis evaluations are unchanged, increased risk-aversion on the part of emergency screeners (or magistrates) can lead to a greater proportion of evaluations resulting in TDOs. Because of these different routes it is important to look at trends in the ***number of evaluations*** as well as the ***proportion of evaluations resulting in TDOs***. Unfortunately, reliable data on evaluations only go back to October 2014, sometime after both the Deeds incident and the implementation of the law related to state hospital TDOs. Figure 1 shows trends in evaluations, as well as the number of TDOs overall and the number of TDO outcomes per 10 evaluations. Because the data from the first quarter of fiscal year 2015 had not been corrected to reflect the new, standard definition of crisis evaluation, only the last three quarters (October-June) of each year are compared, to enable a valid comparison between different fiscal years.

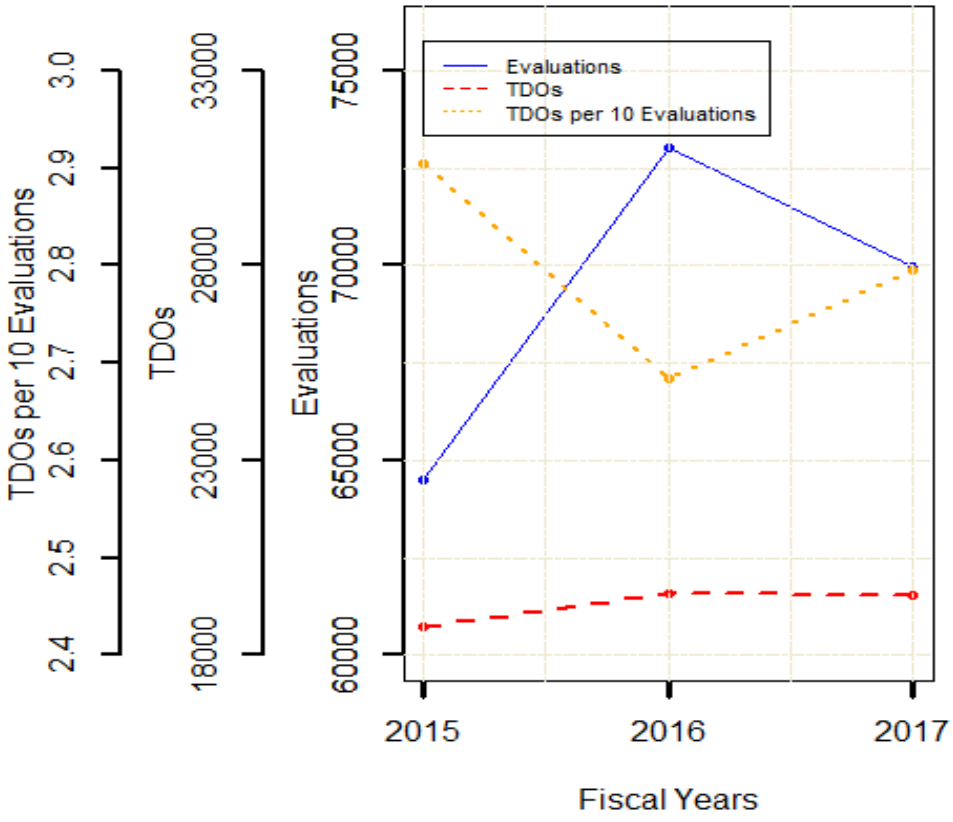


Figure 1 shows that there was a *sharp increase in crisis evaluations from fiscal year 2015 to 2016*, concurrent with a *small decrease in the number of TDOs per 10 evaluations*. This indicates that there was an overall increase that impacted both TDO and non-TDO evaluations,

but the non-TDO evaluations increased more. Increases in TDOs from 2015 to 2016 were associated with increases in evaluations ($r=0.35$, $p=0.0267$), but not with changes in the proportion of evaluations resulting in TDOs. There was a slight decrease in evaluations in fiscal year 2017, concurrent with an equivalent increase in TDOs per 10 evaluations. This indicates that the decrease in evaluations was entirely a decrease in non-TDO evaluations. Accordingly, statewide TDOs were nearly unchanged (-0.2%) from the last three quarters of 2016 to the last three quarters of 2017. Localized increases in TDOs from 2016 to 2017 were associated with increases in the proportion of evaluations that resulted in TDOs ($r=0.46$, $p=0.0025$), but not with increases in evaluations.

A. Community Characteristics that Influence the Number of Evaluations

A model was created to determine which factors influenced the number of evaluations in 2015, as well as the increase in evaluations from 2015 to 2016 (See Appendix B: Statistical Methods). The model for historical counts of evaluations included the following eight variables, in order of adjusted statistical significance: the catchment area population of adults with SMI, the proportion of the population that were married, the number of CSB clients receiving treatment for SUD, the proportion of the population that were under 19, the administrative structure of the CSB (operating vs. other), the rate of opioid overdoses per 100,00 catchment area population, the proportion of the population that were female, and the number of people receiving medication for mental illness at the CSB. Higher numbers of CSB SUD clients, having an operating CSB, and a higher proportion of females were all somewhat suggestive ($0.1 \leq p < 0.2$) as risk factors. A higher proportion of youth and a higher case rate of opioid overdoses were somewhat suggestive as protective factors contributing to lower numbers of evaluations. Although a higher proportion of married people was highly suggestive ($0.05 \leq p < 0.1$) as a protective factor, only the adult SMI population had a statistically significant association ($t=5.0$, $p<0.0001$) with the number of evaluations. The association between higher numbers of people with severe mental illness and higher numbers of psychiatric crisis evaluations is intuitively obvious and requires no further discussion.

The model for increases in evaluations over time included the following seven variables: the SMI population divided by the number of outpatient MH clinics that accept Medicaid, the amount of money that the CSB spent on SUD treatment in fiscal year 2016, whether or not the CSB established a new CIT assessment center in fiscal year 2016, the difference in the SMI population from 2015 to 2016, the proportion of households with annual incomes under $25,000, the percent change in the number of opioid overdoses from 2015 to 2016, and the percent change in the overall population. Greater increases in the SMI population and a higher proportion of household with incomes under $25,000 were both somewhat suggestive as risk factors for an increase in evaluations. Having a new CIT assessment center in 2016 was a highly suggestive risk factor. The only two statistically significant predictors were SMI population per clinic (Chi-square=5.1, $p=0.0241$) and SUD treatment expenditures (Chi-square=3.9, $p=0.0485$). The association of increased evaluations with having fewer outpatient clinics for the population highlights the importance of preventative treatment in averting psychiatric crises. The number of clinics included both CSB clinics and private, non-profit organizations. The fact that it was a much stronger variable than any of those derived from CSB treatment data alone demonstrates

the importance of taking into account the private sector in discussing access to preventative care. As mental health treatment is determined to have a protective effect, it seems counterintuitive that increased SUD treatment should be a risk factor. The clue may lie in the suggestive association between a lower opioid overdose case rate and higher numbers of crisis evaluations in the first model. This could indicate a lack of integration between SUD and MH services such that people receiving treatment for opioid use disorder, but not for an underlying mental illness, are merely changing one type of emergency for another.

B. Community Characteristics that Influence the Proportion of Evaluations that result in TDOs

A model was created for the proportion of evaluations that resulted in TDOs in fiscal year 2015. This model included the following six variables: the proportion of the population that were African-American, the percent of CSB funding that came from Medicaid in fiscal year 2015, the year in which the CIT assessment center was funded, the proportion of the population that were female, the proportion of the population that were privately insured, and the number of people receiving behavioral health services at the CSB. A higher proportion of the population that were privately insured was a somewhat suggestive risk factor. A higher proportion of females was a somewhat suggestive protective factor. The year of CIT assessment center funding had a highly suggestive association with the proportion of evaluations resulting in TDOs. Two of the variables were statistically significant. A higher proportion of African-Americans was a risk factor ($t=2.87$, $p=0.0072$). Research indicates that African-Americans tend to have more stigmatized views of mental illness[2] and are less likely to seek treatment[3]. This may lead to reduced utilization of services that might prevent crisis, as well as resistance to voluntary treatment options during a crisis. Greater Medicaid-dependency ($t=2.53$, $p=0.0164$) was also a risk factor. While it is unlikely that the source of funding would, in and of itself, influence outcomes, high Medicaid dependency may indicate a combination of limited community resources and lack of state support through special programs such as Assertive Community Treatment (ACT) and services for the homeless.

2. Rao, Deepa, Joseph Feinglass, and Patrick Corrigan. "Racial and ethnic disparities in mental illness stigma." Journal of Nervous and Mental Disease (2007).
3. Mills, Meghan L. "Unconventional mental health treatment: Reexamining the racial-ethnic disparity in treatment-seeking behavior." Psychiatric Services 63.2 (2012): 142-146.

IV. Specific Contributing Factors

Seasonally adjusted TDO (SATDO) rates were compared from one quarter to the next in order to develop hypotheses on events that may have been associated with the rise in TDOs. Table 7 gives an overview of quarterly changes as described in section II.

Table 7: Quarterly changes in the SATDO rate, by region and statewide.

	FY 2014		FY 2015				FY 2016				FY 2017				Whole Period
	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	
Region 1	—	↑	↑	—	—	—	↓	—	↑	—	—	—	—	—	—
Region 2	—	↑	↑	—	—	↑	—	—	↑	—	—	↑	—	↓	↑
Region 3	—	—	—	—	↑	↑	—	—	↓	—	—	—	↑	↓	—
Region 4	—	↑	↑	↓	↑	—	↑	↓	—	—	—	—	—	—	—
Region 5	↓	↑	—	—	↑	↓	—	—	—	—	↓	—	—	↓	—
Statewide	—	↑	—	—	↑	—	—	—	—	—	—	—	—	↓	↑

A. Deeds Effect

From January to April 2014, there was a large, statistically significant statewide increase in adjusted TDOs. This created the greatest quarterly change across the entire 3-year period statewide (+2.2 SATDOs/CSB/month). A similar change was observed in most of the regions but especially in regions 1 (+2.8) and 4 (+5.2). One theory often cited to explain this increase is the highly publicized death of Austin Deeds. On November 18, 2013 Deeds was placed under an emergency custody order (ECO), due to his father's concerns about his delusions and gun ideation. The CSB prescreener who evaluated him did not find a bed within the six hours of the ECO, and Deeds had to be released, per Virginia law. Deeds and father went back home for the night. The following day, Deeds stabbed his father and fatally shot himself. This was the most dramatic failure of Virginia's mental health system since the Virginia Polytechnic Institute massacre of 2007. The event received considerable media attention in Virginia, leading to increased awareness of the ECO/TDO process, which may have led to increased petitions. CSBs were under great pressure, which may have caused prescreeners to redouble their efforts to obtain TDOs for clients. Prescreeners in Region 1 also reported that state hospitals were more amenable to taking TDO admissions following the Deeds incident.

B. The Last Resort Effect

Starting on July 1, 2014, prescreeners were required by Virginia state law (Va. Code §§ 37.2-809(E), 16.1-340.1 as amended by Senate Bill 260 and House Bill 293) to use state psychiatric facilities as the placement of last resort if a person met criteria and a TDO would be sought. If a determination was made that a person required temporary detention, it was no longer possible to release them if a bed could not be found, as had happened in the case of Austin Deeds. Northern Virginia, Regions 1 and 2, saw an increase in adjusted TDOs immediately following the implementation of the new law. The fact that Deeds lived in Region 1 may be a factor in the differential impact that the law had in the northern versus the southern regions. Prescreeners in these regions may have been more likely to pursue a TDO, knowing that the client was guaranteed a bed. Region 3 did not show an increase at the beginning of fiscal year 2014. Region 5 saw a stable increase later that same quarter, although it was not statistically suggestive. While Region 4 did have an increase in the 1st quarter, the frequency of TDOs immediately dropped to previous levels the following quarter.

C. GAP Effect

On January 1, 2015, the Governor's Access Plan, which provides medical and mental health treatment to low-income people with severe mental illness, went into effect. Within that same quarter, the frequency of seasonally adjusted TDOs rose in Regions 3 and 4. TDOs rose in Region 5 as well, only to return to previous levels in the 4th quarter. Region 2 showed a similar increase in the following quarter. These were the greatest quarterly increases in the entire 3-year period for Regions 2 (+5.3 SATDOs/CSB/month) and 3 (+5.5). While this does not prove a connection, Oregon saw a similar increase in the use of emergency services when it expanded Medicaid[4,5]. Although this increase applied to emergency departments in general, not just mental health services, it is interesting to note that the new emergency department referrals in Oregon did not typically result in lengthy inpatient services. This may be a parallel to the observation that the Virginia TDO increases in fiscal year 2015 were less likely to result in involuntary commitments (see Statewide Trends, page 4).

D. CITAC Effect

At the beginning of fiscal year 2016, 16 CSBs received funding to establish crisis intervention team assessment centers (CITACs). This is the largest increase in CITACs in the history of Virginia. CITACs allow on-duty police officers to transfer custody of people with suspected mental illness to CSB staff and off-duty police officers for crisis assessment and possible placement in treatment. As the fiscal year progressed, more and more of these new CITACs became operational. This is relevant to the volume in TDOs, because, in fiscal year 2016, 58% of CITAC encounters resulted in TDOs. In prior years, some of the clients might have been sent to jail instead of being evaluated by CSB staff. The greatest increases in TDOs

4. Taubman, Sarah L., et al. "Medicaid increases emergency-department use: evidence from Oregon's Health Insurance Experiment." *Science* 343.6168 (2014): 263-268.

5. Finkelstein, Amy N., et al. "Effect of Medicaid coverage on ED use—further evidence from Oregon's experiment." *New England Journal of Medicine* 375.16 (2016): 1505-1507.

were observed in Region 2 (+4.54 SATDOs/CSB/month) and Region 1 (+2.1), both of which established three new CITACs in fiscal year 2016. Region 4 established no new CITACs that year and Region 3 established only two. In Region 5, TDO increases in the CSBs that had new CITACs were considerably counter-balanced by TDO declines in CSBs that did not.

E. Conclusions about Trends in Adjusted TDOs

The staggered nature of the trends in adjusted TDOs over time would suggest that multiple factors are involved, including the publicity of the Deeds tragedy, especially in Regions 1 and 4, the implementation of statutory changes requiring admission to state hospitals if no other bed is available, especially in Region 2, the implementation of GAP, especially in Regions 2 and 3, and the widespread establishment of CIT assessment centers, especially in Regions 1 and 2.

V. Summary and Discussion

Over the past four years, temporary detention orders have been increasing. While the most recent data available may indicate a decline, there is no reason to believe that TDOs will return to previous lows in the absence of a significant change in law or policy. The greatest increases are in the Washington D.C. and Northwestern areas.

It is important to bear in mind the limitations of this study. Although an event may happen shortly before an increase in TDOs, it does not prove that the one causes the other. As previously mentioned, the lack of data from private hospitals makes it impossible to determine patterns of voluntary hospitalization, as well as regional and local differences in private TDO admissions. Data on state hospital admissions by region might provide a clearer picture on how external factors affect the state hospitals. One region might have more bed days because they have more TDOs, or because they have fewer private hospitals willing and able to absorb those TDOs.

There is also insufficient data to draw conclusions about the impact of crisis intervention team (CIT) training, without an assessment center. Between June 2015 and June 2016 the number of CIT-trained correctional officers increased by 38%. It is possible that a similar increase occurred among patrol officers. This could have led to an increase in TDOs if CIT-trained officers were more likely to divert people with MI to mental health services than place them in jail. Alternatively, this could have ameliorated the TDO problem if CIT-trained officers were more effective at de-escalating people with MI in crisis.

Whatever the relative contributions of the Deeds effect, the “last resort” legislation, the initiation of the GAP program, and the increase in CITACs, there has been a substantial increase in TDOs across the state, and particularly in specific localities, over the past 4 years. This development highlights the continuing need to increase access to outpatient services to prevent crises from occurring and to create intensive alternatives to hospitalization when crises do occur,

including psychiatric emergency centers, mobile crisis units; crisis stabilization facilities, and evaluation and referral centers. In addition, it would be helpful to educate the public, particularly new Medicaid recipients and their families, on how to access medical and mental health services when needed.

Appendix A: Trends in Seasonally Adjusted TDOs at the CSB level

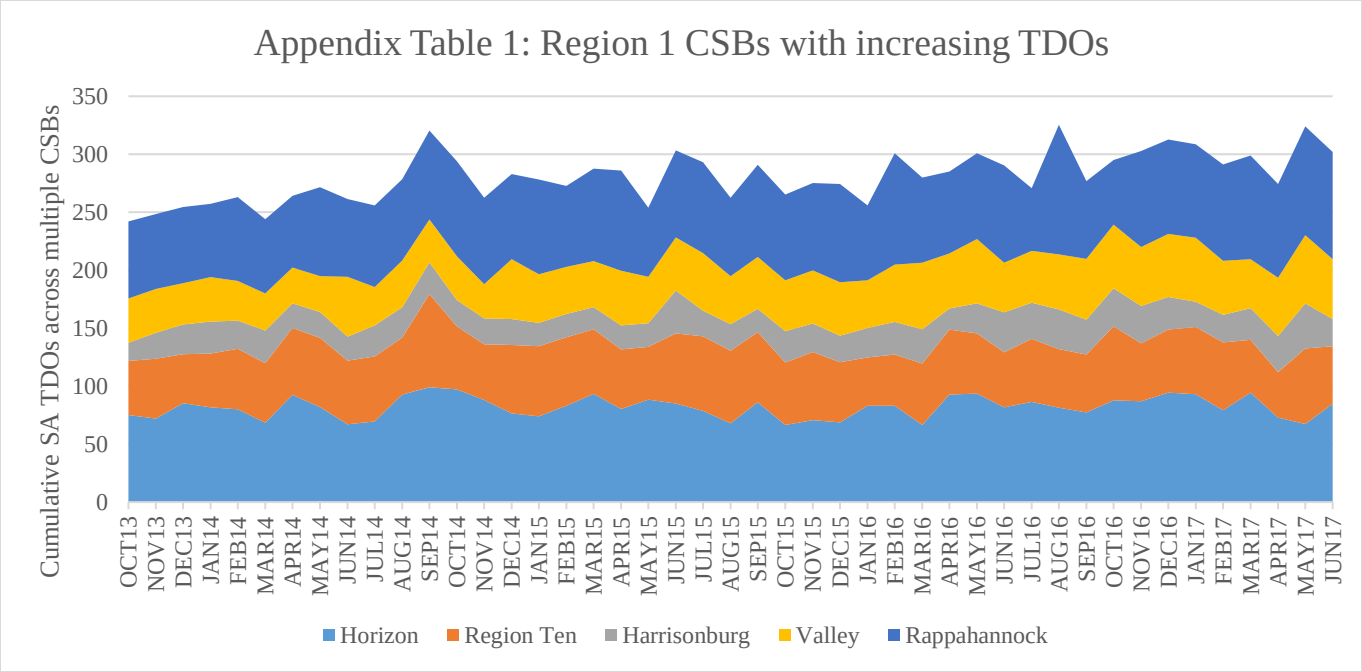
Seasonally adjusted TDOs were observed at the individual CSB level. The CSBs were then categorized based on the following criteria:

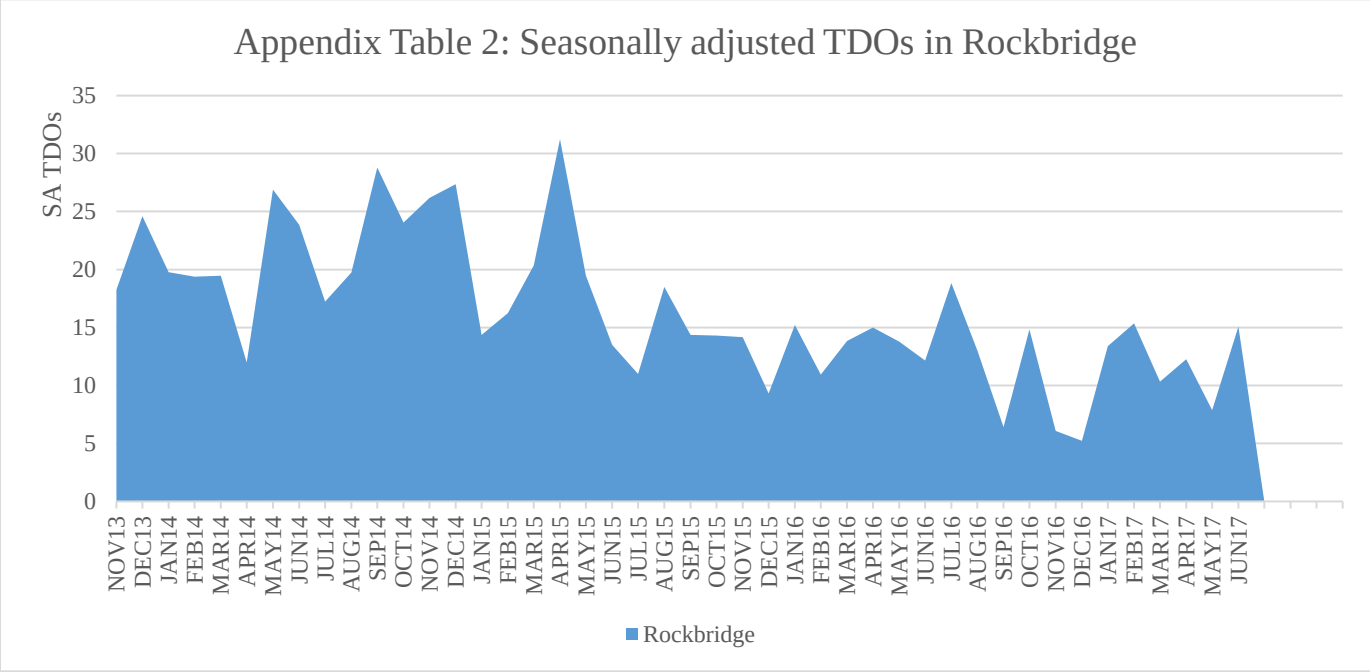
- Increasing TDOs: If seasonally adjusted TDOs in the last quarter of fiscal year 2017 were at least 15% greater than seasonally adjusted TDOs in the first quarter of fiscal year 2014.
- Unchanged TDOs: If there was an increase of less than 15%, or a decrease of less than 15%.
- Decreasing TDOs: If average seasonally adjusted TDOs in the last quarter of fiscal year 2017 were more than 15% lower than those of the first quarter of fiscal year 2013.

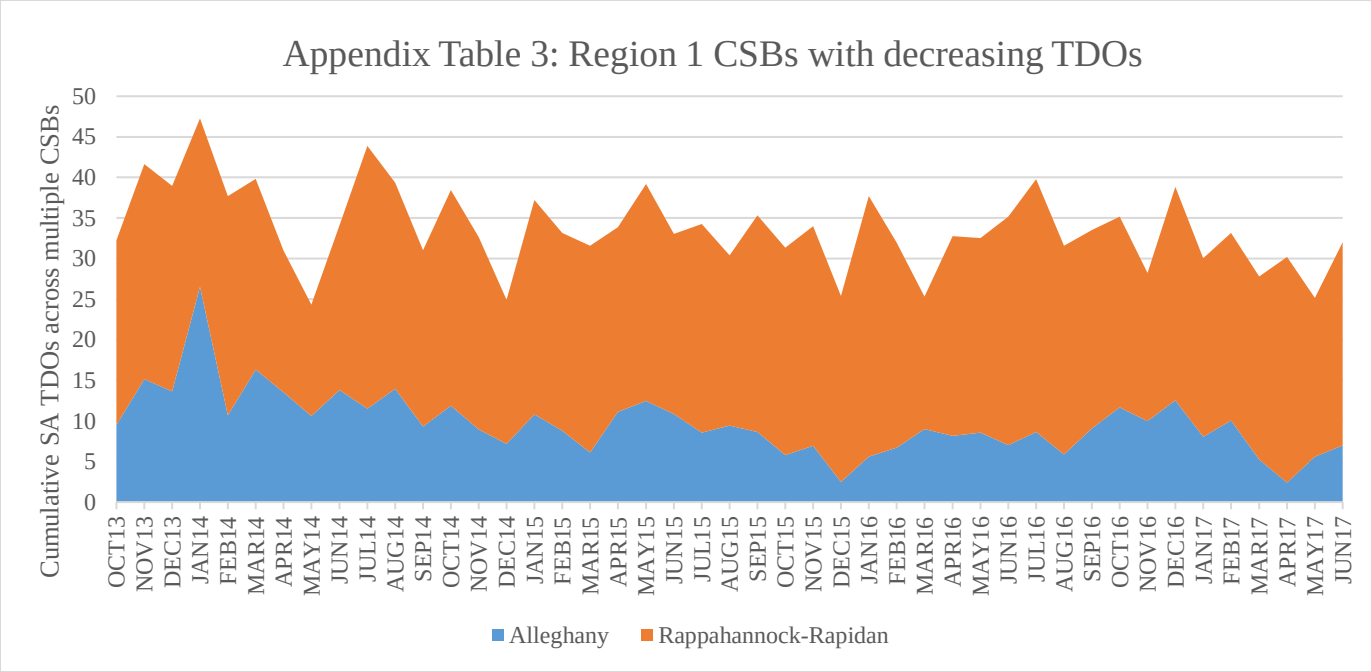
Charts were created by grouping CSBs by category and region. The charts show the total number of SA TDOs for each group, cross-sectioned by TDO of origin.

A. Region 1

Appendix Table 1 shows seasonally adjusted TDOs for CSBs that saw an increase of at least 15% across the period in Region 1. The CSB with the greatest increase in seasonally adjusted TDOs was Rappahannock, which saw a 58% increase. Appendix Table 2 shows Rockbridge, where TDOs declined by less than 15%. Appendix Table 3 has CSBs that experienced sizable decreases in TDOs across the period. The greatest reduction was in Alleghany-Highlands (-54%).

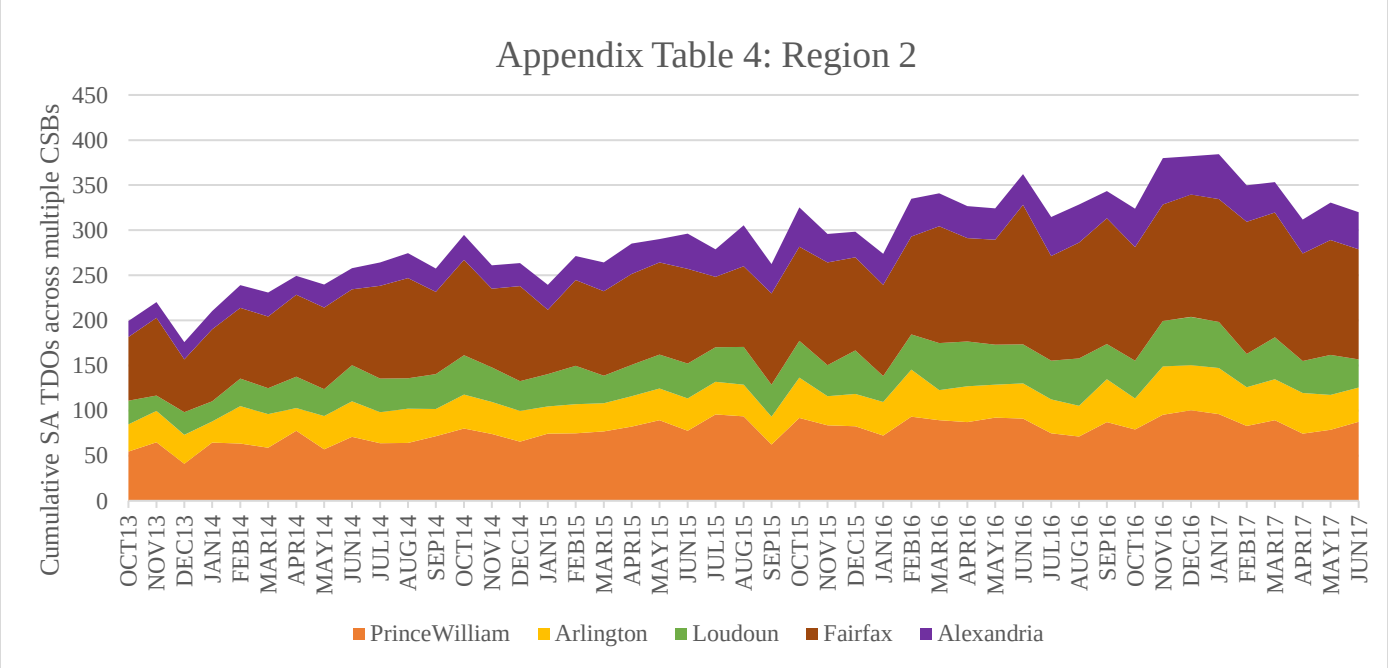

Appendix Table 1: Region 1 CSBs with increasing TDOs
Cumulative SA TDOs across multiple CSBs
350
300
250
200
150
100
50
0
OCT13 NOV13 DEC13 JAN14 FEB14 MAR14 APR14 MAY14 JUN14 JUL14 AUG14 SEP14 OCT14 NOV14 DEC14 JAN15 FEB15 MAR15 APR15 MAY15 JUN15 JUL15 AUG15 SEP15 OCT15 NOV15 DEC15 JAN16 FEB16 MAR16 APR16 MAY16 JUN16 JUL16 AUG16 SEP16 OCT16 NOV16 DEC16 JAN17 FEB17 MAR17 APR17 MAY17 JUN17
Horizon
Region Ten
Harrisonburg
Valley
Rappahannock


Appendix Table 2: Seasonally adjusted TDOs in Rockbridge
SA TDOs
35
30
25
20
15
10
5
0
NOV13 DEC13 JAN14 FEB14 MAR14 APR14 MAY14 JUN14 JUL14 AUG14 SEP14 OCT14 NOV14 DEC14 JAN15 FEB15 MAR15 APR15 MAY15 JUN15 JUL15 AUG15 SEP15 OCT15 NOV15 DEC15 JAN16 FEB16 MAR16 APR16 MAY16 JUN16 JUL16 AUG16 SEP16 OCT16 NOV16 DEC16 JAN17 FEB17 MAR17 APR17 MAY17 JUN17
Rockbridge



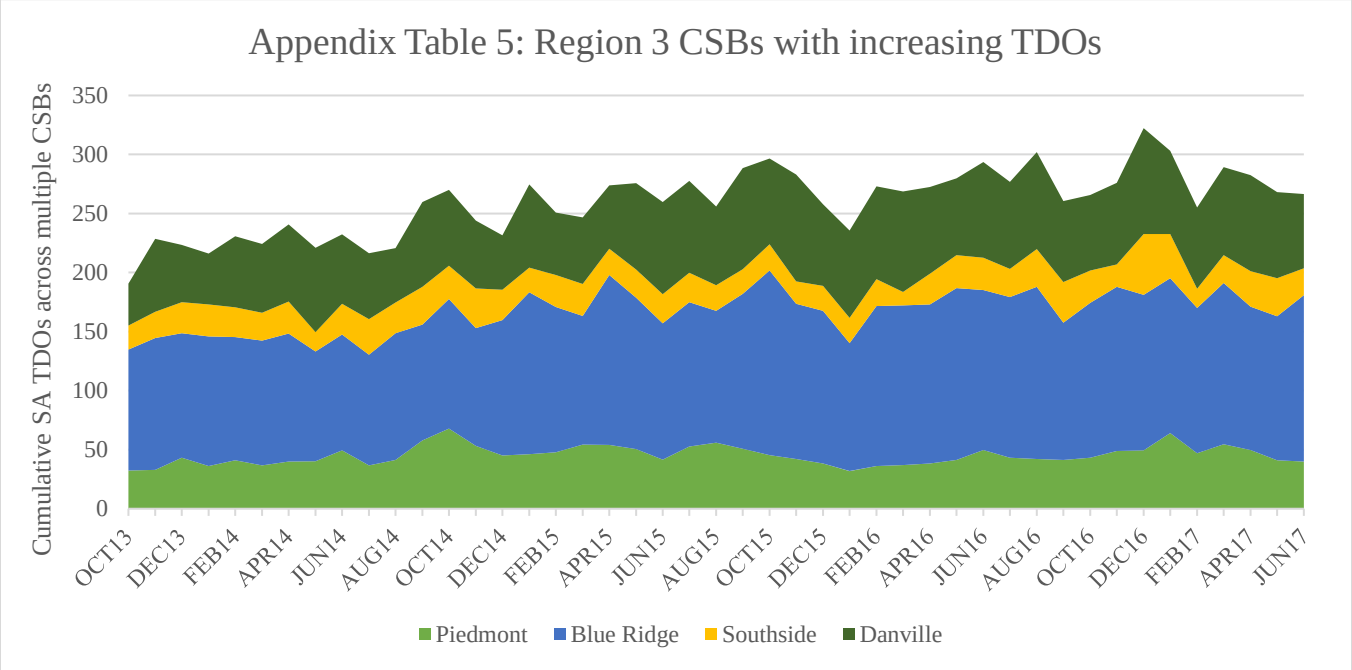
B. Region 2

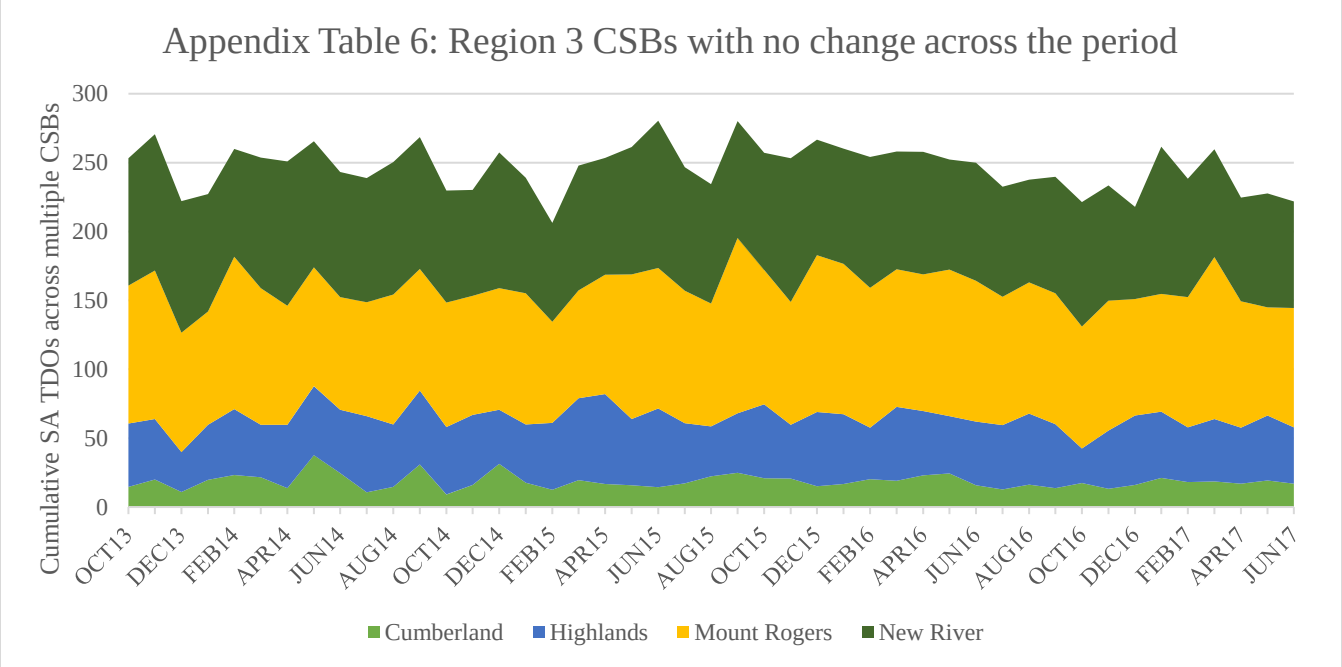
All of the CSBs in Region 2 saw a large increase in seasonally adjusted TDOs across the period (Appendix Table 4). Alexandria had the greatest increase, at 126%.

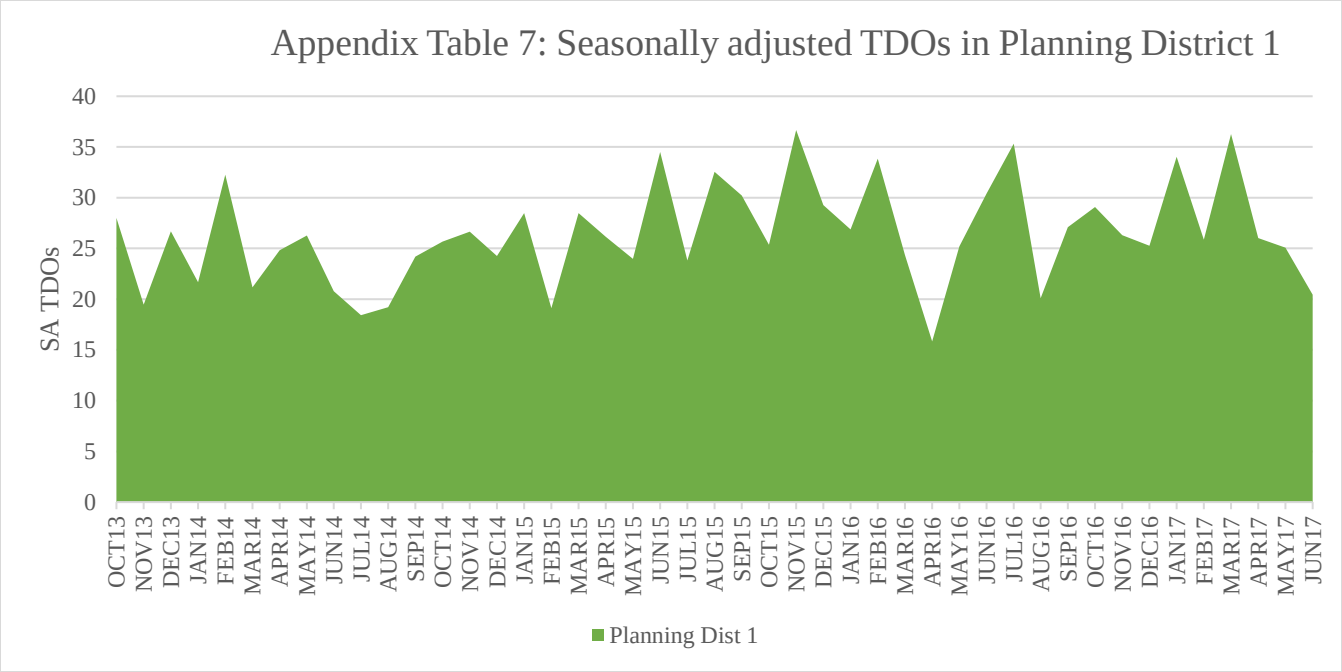


C. Region 3

In Region 3, the CSBs with the greatest increase in TDOs were Danville and Southside with 50% (Appendix Table 5). Appendix Table 6 shows seasonally adjusted TDOs for those CSBs where the increase was less than 15%. Planning District 1 saw a decrease of 16% (Appendix Table 7).

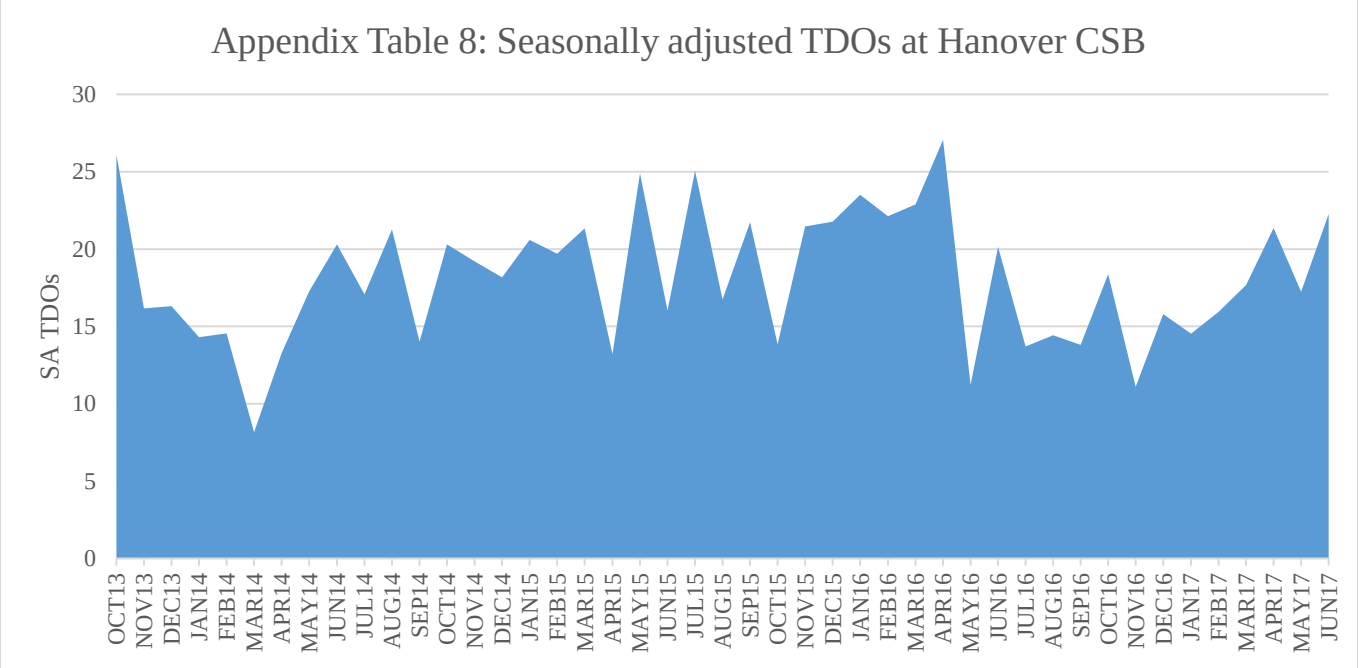


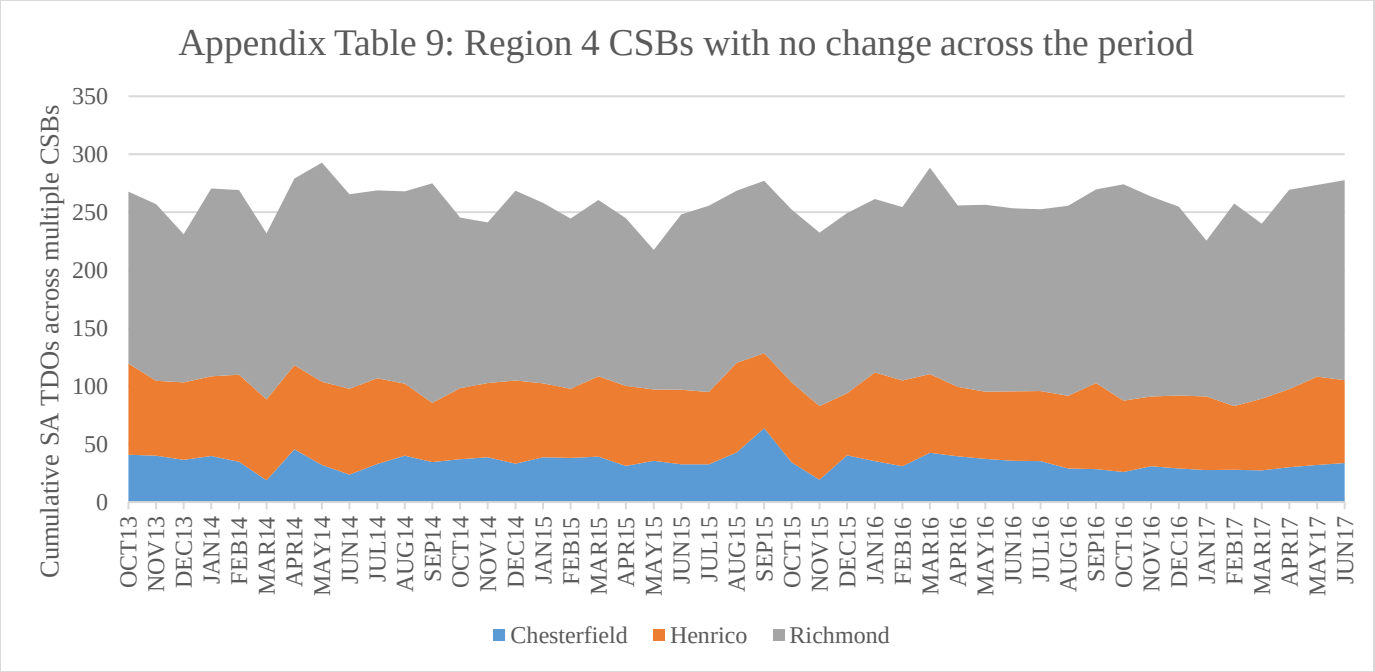


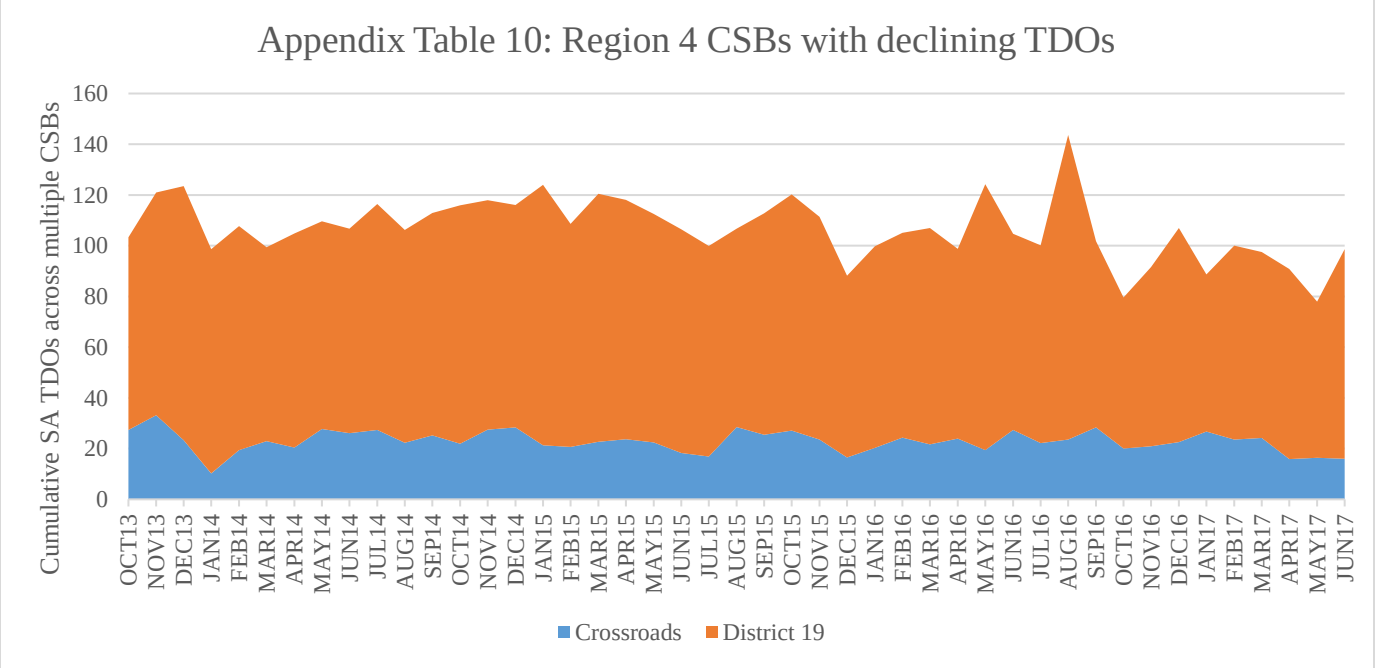


D. Region 4

Hanover was the only CSB in Region 4 to see a sizable increase in TDOs (25%) across the period (Appendix Table 8). Appendix Table 9 shows seasonally adjusted TDOs for CSBs where the increase was less than 15%. The greatest TDO decline was in Crossroads, at 18% (Appendix Table 10).

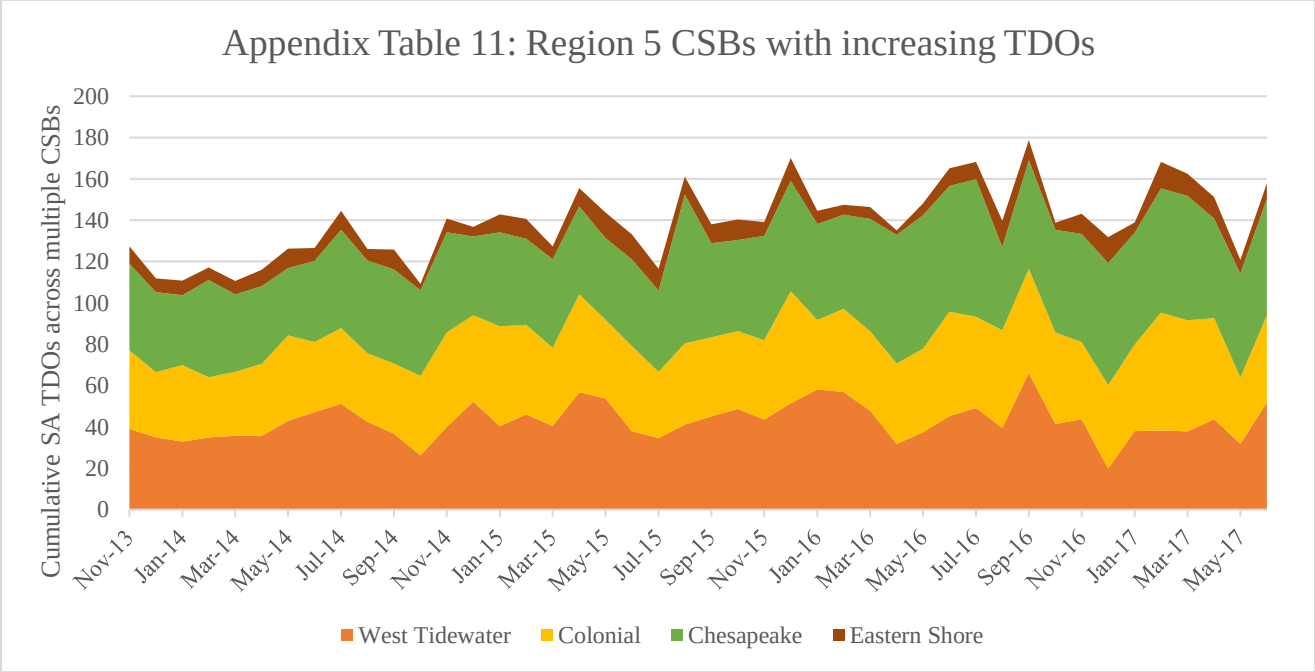


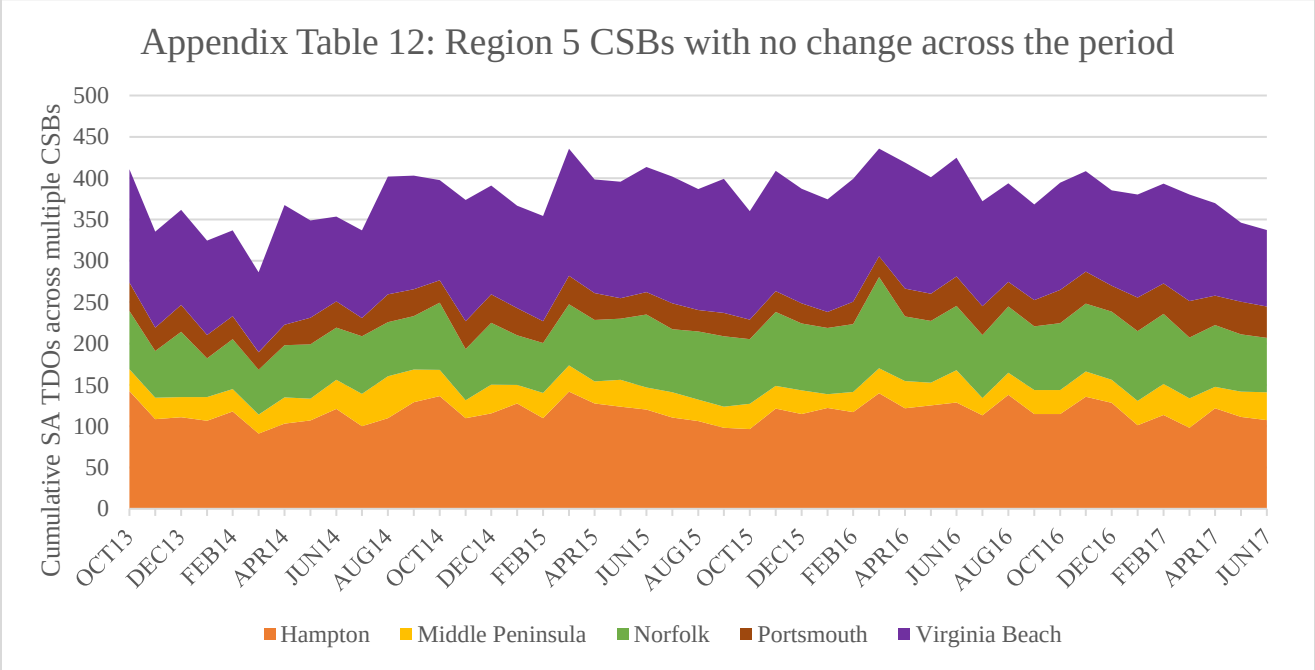




E. Region 5

Most of the CSBs in Region 5 saw a sizable increase in TDOs (Appendix Table 12). The greatest increase was in Chesapeake, where seasonally adjusted TDOs rose by 35%. Appendix Table 13 shows those CSBs that did not change by more than 15% in either direction.





F. Conclusions about CSB-Level Trends

Although the regional trends for Regions 2 and 5 can be thought of as summarizing the trends of their constituent CSBs, this is not the case for Regions 1, 3 and 4. Declines in Region 4 are seen in CSBs south of Richmond, while Richmond and its suburbs have seen slight to moderate increases in TDOs. The TDO increase in Region 3 is largely driven by increases in sub-region 6, which is south of Region 4 and consists of Piedmont, Danville-Pittsylvania and Southside CSBs. In Region 1, the apparent lack of lasting change at the regional level masks

dramatic differences at the CSB level, with some CSBs showing sharp declines in TDOs, while others have shown large increases.

Appendix B: Statistical Methods

A. Trends in TDOs

In order to determine seasonally adjusted TDOs, raw data on TDOs from 2012 through March 2017 were obtained from the Supreme Court of Virginia. This data included all age groups. TDOs from January 2012 to February 2017 were adjusted for seasonal effects using the X12 algorithm developed by the U.S. Census Bureau. Adjustment was at the CSB catchment area level. Data from the low-population areas of Dickenson (Region 3) and Goochland-Powhatan (Region 4) could not be included because their monthly TDO rates were too low to allow for adjustment.

In order to detect short term changes, a paired t-test was used to compare each quarter to the next and previous quarter (α=0.025). The first quarter included in analyses was the 2nd quarter of fiscal year (FY) 2014, which is October through December 2013, and the last was January and February 2017, because March 2017 data was not available at the time. Average TDOs per month were compared, instead of total TDOs for the quarter, to diminish the impact of missing months. In addition to March 2017, February 2015 was excluded because it was an unusually cold month, ten degrees colder than the previous and following Februaries. This may have caused a temporary, but statistically significant, drop in TDOs, making February 2015 an outlier to the overall trends. March 2014 was also excluded as an outlier. It was the month that prescreeners first began using the PBR to search for beds. This may have had a short-term impact. In addition to comparing adjacent quarters, 2nd quarter FY 2014 was compared with the 3rd quarter of FY 2017 to determine change across the entire period. The same process of paired t-test analyses was used for assessing short term trends within individual regions. Due to small sample sizes of CSBs within regions, quarterly trends were evaluated for statistical suggestiveness (α=0.2), in addition to statistical significance (α=0.025).

B. Trends in Evaluations and Their Outcomes

As the change in the number of evaluations was not normally distributed across the state, the association between the change in evaluations from one year to the next and the concurrent change in TDOs was determined using the Spearman Correlation coefficient. The association between the change in TDOs and the change in TDOs per 10 evaluations was determined using the Pearson correlation coefficient.

Policymakers in the Commonwealth are interested in investigating a wide variety of variables related to mental health services and community characteristics, and whether or not they are associated with the mechanisms of the TDO process in the context of a multivariate model. This was the impetus behind the creation of three models related to evaluations and their outcomes. Estimated SMI population is one of the variables in question. The estimated

proportion of the catchment area adult population that had SMI in 2012 was provided by Dr. Steven Stern formerly of Stony Brook University. His methods of deriving these estimates have been published previously[4]. The SMI proportions were then multiplied by the catchment area adult population for fiscal year 2015 and fiscal year 2016. Another important variable is the number of opioid overdoses. Data related to prescription opioids had to be used, as the available data on heroin was very incomplete.

A linear model was created to predict historically high numbers of evaluations, as opposed to increases. Unfortunately, reliable data on evaluations only go back to October 2014. Total evaluations across the last three quarters of fiscal year 2015 had to be used as the dependent variable for this baseline model, even though this report as a whole is concerned with trends going back to July 2013.

With a sample size of 40 it was necessary to limit the number of variables in the model to 10 or less. This was accomplished using a mixed step-wise model-building process, with in and out criteria of p=0.5, after bivariate associations were determined using spearman correlation coefficients. The number of evaluations was square root transformed for the modelling process. In this and all other models in the study, variables were ultimately identified as statistically significant if the adjusted p-value was less than 0.05.

Another multivariate model was created for the change in evaluations from fiscal year 2015 to 2016. To make the observed change a meaningful number, the last three quarters of fiscal year 2016 were used to calculate the difference, instead of the whole year. A dichotomous variable was created in which CSBs that saw an increase in evaluations greater than or equal to 15% were placed in one group, and those that did not were placed in another. Again, a mixed step-wise model-building process was used to winnow down the number of variables, although this time logistic regression was used and the in criteria were expanded to p=0.6, as bivariate associations for this variable were generally weaker and a more stringent in criterion was not needed to keep the number of variables down.

A third model was created for the proportion of evaluations that resulted in TDOs in fiscal year 2015, using the same methods as the model for evaluations that year, except that the data were not square root transformed, and the in and out criteria were set to p=0.6. No model was created for increases in the proportion of evaluations that resulted in TDOs, as this has gone down statewide, with only a small number of CSBs proving the exception, too few to allow for a useful model.

4. Johnson, William C., et al. "Variation in mental illness and provision of public mental health services." Health Services and Outcomes Research Methodology 17.1 (2017): 1-30.