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An Examination of Seasonal Trends in Delaware Drug Overdoses, 2016-2020

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Abstract

Objective: To examine whether overdose deaths and related metrics—overdose calls for service to police and non-fatal overdose emergency department visits—in Delaware follow within-year (i.e., seasonal) patterns during the most recent years of the opioid epidemic (2016-2020). **Methods**: We begin by providing descriptive statistics on yearly trends in overdose metrics, followed by Analysis of Variance (ANOVA) to analyze whether seasonal variations have a significant impact on the patterns of Delaware's overdose metrics while controlling for annual variations. **Results**: We find yearly variations across the three overdose-related metrics, with overdose deaths reporting the only consistent increases per year. Within-year, or seasonal, variations show the spring months have the most consistent increases in overdose deaths and overdose calls for service across years we studied. Finally, we report significant differences for all overdose metrics across years and seasons. **Conclusions**: As in prior studies, we find significant variation in overdose-related metrics by season in Delaware. **Policy Implications**: These findings lend support to existing interventions in slowing yearly growth in overdose deaths. However, allocation of resources and interventions to specific times of the year—when overdoses are highest—may further reduce risks and harms.

Introduction

Recently, the *News Journal* in Delaware published the disappointing news from the State's Division of Forensic Science that overdose deaths in 2020 increased, yet again, and set a record at 447 lives lost.[1] This represents an increase of 3% from 2019 (N = 431). As opioid-related morbidity continues in Delaware and across the nation, professionals, policymakers, and other stakeholders are busy seeking solutions.[2] To date, there is a voluminous literature on the factors driving today's opioid problem as well as past drug crises.[3,4] This existing research has most often addressed questions around who, what, where, and why the opioid epidemic is persisting and has also guided policymakers and professionals in formulating and implementing solutions. However, some questions remain understudied and warrant further attention. One question that remains includes how overdose deaths might vary throughout the year or seasonally. In other words, is there a certain time of the year—or a certain season—when drug overdoses, and deaths from them, are likely to be higher or lower in prevalence?

Currently, research focusing on "when" most often investigates yearly variations in overdoses and only a few studies have investigated distinct and shorter time periods, such as variations from season to season. Thus, our knowledge about overdose death trend variations within a given year is generally lacking. Scientific study of within-year (i.e., seasonal, or quarterly) overdose

trends can enhance intervention efforts by sharpening best practices, improving budget allocation and resource deployment, and assisting communities when their residents are at greatest risk and most in need. An analysis of seasonal variations over time can, for example, uncover if patterns seen in one year are unique in comparison to others or whether these patterns are part of a consistent trend that interventionists can plan for accordingly.

Given this, our study investigates seasonal trends in overdose metrics for the state of Delaware between 2016 to 2020. We examine three overdose-related metrics to capture the scope of the problem: overdose deaths, non-fatal overdose emergency department visits, and overdose calls for service made to Delaware law enforcement agencies. Our analysis establishes the yearly trends and differences between these metrics before turning to the within-year, or seasonal, variations of them. Based on our findings, we conclude our discussion by offering policy implications that may help to address seasonal variations of overdoses within Delaware.

Within-Year Variations in Social and Behavioral Health Outcomes

Overtime, there have been important studies published on seasonal or quarterly variations in numerous behavioral health outcomes, including crime rates, suicide, and substance use. For the most part, seasons and quarters correspond with each other because they are both measured in three-month units that closely align with astronomical seasons and the Gregorian calendar.[5,6] For example, the second quarter of the year includes April, May, and June, which overlaps most closely with springtime in the Northern Hemisphere since the summer solstice does not occur until the later part of June—approximately June 21 each year to be precise.[5,6] Studies to date have generally shown within-year cycles for each of these phenomena, but their fluctuations depend on myriad factors (e.g., weather, type of crime observed). The next sections briefly review existing knowledge about within-year or seasonal variations in crime, suicide, and substance use to inform our research objective.

Crime

In a study of crime rates across US cities, McDowall, Loftin, and Pate found that all major crimes (i.e., violent and property index crimes) showed similar seasonal trends.[7] Specifically, most of the crime rates peaked in the summer months (July or August) and dropped to their lowest point during the winter (i.e., December, January, and February). Robbery and murder were exceptions to this pattern. Robbery peaked in December while murder did so in August.[7] Notably, they reported that February tended to be the lowest point for crimes in their analysis. In a later analysis, McDowall and Curtis examined the within-year variations in assault and homicide more closely.[8] They found patterns for both forms of violence, but that within-year patterns are more pronounced for assaults than for homicides.

Suicide

Suicide is another behavioral health outcome studied through a within-year framework. For example, Rocchi, Miotto, and Preti considered within-year trends in suicide in Italy from 1984 to 2000 and compared these trends to those of overdose deaths.[9] Suicide risk for males was higher between March and July, months spanning from late-winter/early-spring to summertime, while female suicide risk was highest during February/March and September. In another study, Rocchi, Sitsi, Cascio, and Preti observed suicide by season in Italy again from 1974 to 2003.[10] Based on their analysis, the authors reported a notable suicide peak during the spring relative to other

seasons and, also, that this trend persisted over the entire time frame they considered.[10] More recently, Yu et al.'s research supported the spring peak and winter decline in suicides across several countries.[11]

Substance Use and Overdoses

Prior studies of within-year patterns in drug overdoses tend to show fluctuations throughout the year. For example, Rocchi et al. reported drug-involved death trends suggesting a higher risk of death in cooler months with two peaks in the December-January.[9,12] However, they also found a spike in August. As such, Rocchi et al. conclude there are within-year patterns regarding unintentional overdose deaths in Italy.[9,12] Notably, these overdose trends differ from the pattern Rocchi et al. reported for suicides.[9] Years later, Sadler and Furr-Holden's study in Flint and Genesee County in Michigan revealed the summer (110) had the fewest opioid overdose deaths with the most occurring in the spring (151), followed by winter (143), and finally the fall (139).[13] Sadler and Furr-Holden (2019) noted these findings offered some contradiction to a study in Ohio conducted by Weiner et al. showing prescriptions for opioids were more common in the summer.[13,14]

Other studies have examined overdoses in relation to quarterly trends, that closely parallel seasons, with Q1 typically being the winter (January - March), Q2 the spring (April - June), Q3 the summer (July - September) and Q4 the fall (October - December). In doing so, Vivolo-Kantor et al. reported that the highest change rate increase in suspected opioid overdose emergency department visits happened between Q1 of 2017 and Q2 of 2017 (13.15%), or as winter transitions to spring.[15] The second highest change occurred between Q2 of 2017 and Q3 of 2017 (7.68%) (i.e., as spring transitions to summer) when examining *National Syndromic Surveillance Program* (NSSP) data from July 2016 to September 2017. On the other hand, in their examination of *Enhanced State Opioid Overdose Surveillance Program* (ESOOSP) data, Vivolo-Kantor et al. found that the highest growth rate increase occurred between Q1 and Q2 of 2017 (13.06%) (i.e., as winter transitions to spring) with the changes between Q3 and Q4 of 2016 (8.91%) (i.e., as summer transitions to fall) and Q4 of 2016 and Q1 of 2017 (9.09%) (i.e., fall transitions to winter) close behind.[15]

Based on these studies, opioid-related complications appear to be more prominent during the spring (Q2 in 2017) and summer, with some escalation in fall months (Q3 of 2017). These findings coincide with overdose death trends to some degree with the spring having a relatively higher prevalence of emergency visits and overdose deaths and the emergency visits increasing further in the summer.[9,12,13] Overall, for opioid-related emergency department visits, there were increases between each quarter or season, but the only statistically significant change occurred for the entire time frame under study—from Q3 (or fall) of 2016 to Q3 of 2017.[15] Thus, quarter-to-quarter fluctuations were not significantly different from one another.

In another examination of suspected heroin overdose emergency visits, Vivolo-Kantor, Hoots, David, & Gladden reported seasonal or quarterly changes between 2017 to 2018.[16] They found a significant increase between Q1 and Q2 of 2017 (i.e., as winter transitions to spring), a significant decrease between Q3 and Q4 of 2017 (i.e., as summer transitions to fall), another significant decrease between Q4 of 2017 and Q1 of 2018 (i.e., as fall transitions to winter), and a significant increase between Q1 of 2018 and Q2 of 2018 (i.e., as winter transitions to spring). These results suggest emergency room visits relating to heroin use are most prevalent during Q2 (April, May, June or the spring) and tend to decline throughout the remainder of the year. Thus, a

national sample of heroin emergency visits appear more prevalent during spring months similar to overdose deaths according to Sadler and Furr-Holden's study.[13] Finally, in a study of Cincinnati, Ohio examining overdose emergency calls that were heroin-involved, there were three reported spikes during the period of study: September of 2016, March of 2017, and July of 2018.[17] In addition, Li et al. included measures of temperature and precipitation to account for seasonal variations in monthly overdose calls and found higher temperatures were positively related to the prevalence of calls for heroin overdoses.[17]

In sum, research confirms the existence of within-year or seasonal patterns for substance use and overdose-related phenomena. However, there are important variations depending on the measures considered and location of the study. In Italy, overdose deaths were higher in December-January and August, which appears to be partially inconsistent with findings from US settings regarding emergency visits for overdoses.[9,12] On the one hand, Vivolo-Kantor et al. found the largest increase in opioid-related overdose emergency department visits occurred between winter and spring (i.e., Q1 and Q2) in 2017, but a further increase between spring and summer (i.e., Q2 and Q3) of 2017, making the summer months those with the most visits.[15] Their conclusion about this additional increase appears less pronounced when examining the ESOOSP data relative to NSSP data. Since Q3 includes the month of August, the Vivolo-Kantor et al. finding suggests possible overlap with the overdose death spike Rocchi et al. found.[9,12,15] On the other hand, using ESOOSP data, Vivolo-Kantor et al. report the highest increases in heroin-involved emergency calls from Q1-Q2 (i.e., winter to spring) in both 2017 and 2018, which includes the months transitioning from winter to spring.[16] Notably, Vivolo-Kantor et al.'s Q2 (spring) finding is consistent with what Sadler and Furr-Holden found in Flint, Michigan where they reported opioid-related overdose deaths to be highest in the spring and lowest in the summer; however, this is inconsistent with opioid prescription patterns in OH and overdose deaths in Italy since both had a higher prevalence in the summer.[9,12–14,16]

Overdose Emergency Department Visits in Delaware

Notably, two of the studies discussed above included opioid overdose data from Delaware.[15,16] First, the state-specific change rate trends using the ESOOSP data from Q3 (i.e., fall) of 2016 to Q3 of 2017 for Delaware showed increases between each season or quarter.[15] Their limited timeframe study found the largest increases in emergency visits for opioid-related overdoses between Q1 (i.e., January, February, March) and Q2 (i.e., April, May, June) or as winter transitions to spring (43.00%) in 2017, but the prevalence of visits increases even further as spring (Q2) gives way to summer (Q3: July, August, September) (18.76%). Using ESOOSP data, Vivolo-Kantor et al. also examined change trends in suspected heroin overdoses across states from Q1 (winter) of 2017 to Q2 (spring) of 2018.[16] For Delaware, there was a significant increase between Q1 (winter) and Q2 (spring) of 2018 (37.4%) and a further significant increase of 22.9% from Q2-Q3 (i.e., spring to summer) of 2017. In contrast, there were declines in suspected overdoses from Q3-Q4 (2017) and Q4 of 2017 to Q1 of 2018, and a nonsignificant increase from Q1-Q2 of 2018. These results suggest that suspected heroin overdoses increase in Delaware as the winter becomes spring and again as the spring becomes summer before declining throughout the fall and winter. These seasonal patterns are partially consistent with previous findings relating to overdose deaths and other related measures.[9,12,14,17] Given the patterns and inconsistencies reported, we further investigate the within-year trends in Delaware using a wider time frame across three overdose metrics to determine if there are similarities or differences with these past studies.

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Explanations of Within-Year Trends

Several possible explanations have been hypothesized about these seasonal fluctuations in behavioral health outcomes. *Temperature-aggression theories* propose higher temperatures and humidity levels lead to irritability among people in ways that may increase rates of violence, especially in summer months (i.e., or Q3).[7] Other arguments draw *on routine activities theory* and suggest weather changes influence how people behave and structure their activities.[7,18] Pleasant weather may motivate outdoor activities away from home, thus increasing exposure to victimization. Thus, differences in routine social activities, not just weather patterns, may influence patterns of social and behavioral health outcomes throughout the year.[7] For overdose deaths specifically, within-year trends could also be a result of fluctuations in illicit substance availability or the ability of others to respond to an overdose.[9,12,19] Both the temperature-aggression and routine activities theories posit increased spikes of behavioral health outcomes in the warmer months (i.e., spring and summer).

Psychosocial explanations also explain seasonal variations via individual expectations about events and holidays. For example, the increased likelihood of suicide escalating in the spring (or Q2), on weekends, or around holidays may result from failed expectations of them, leading to increased individual risk.[20] Rocchi et al. also used a psychosocial framework and suggested some parts of the year (i.e., Christmas, New Year's arrival, end of school year) are more likely to create a discrepancy between experiences and expectations, resulting in substance use and increased overdose risk.[9,12]

Our Study

As detailed above, existing research suggests that overdoses and related social phenomena have a within-year pattern related to seasons or quarters. However, such patterns may vary by other factors including location or year.[9,12–14,18] We build on this existing literature by considering the within-year variation of overdose deaths, non-fatal overdose emergency department visits, and calls for service related to overdoses in Delaware from 2016 to 2020. Our approach studies seasonal fluctuations that approximate the Gregorian calendar: winter, spring, summer, and fall.[9,12,20] Next, we discuss our methodological approach to exploring questions about the seasonality of overdose deaths and related phenomena in Delaware before reporting our findings and offering possible solutions to the seasonal variations we report in our findings.

Data and Methods

We analyze yearly and quarterly trends between 2016 and 2020 using multiple overdose indicators in the state of Delaware. Specifically, we examine trends in drug overdose deaths, calls for service made to the police concerning overdoses, and emergency room visits for overdoses that do not result in death. We consider these separate estimates since comparing metrics from multiple datasets allows us to draw more valid conclusions about overdose trends.

Data

The overdose death data for this study come from toxicology files and death reports from the Delaware Department of Forensic Sciences from 2016 to 2020. We produced quarterly counts for each year based on the recorded day of death for each fatal overdose. All deaths were included in these counts (e.g., out of state residents or persons under 18 years of age). Separate from overdose deaths, police overdose calls for service data were provided by the Delaware

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Justice Information System (DELJIS). Delaware police respond to overdoses and DELJIS codes them accordingly with the date of the incident. We used this information to calculate quarterly counts of calls for service for overdose incidents also spanning the years of 2016 to 2020. Monthly data on non-fatal overdose emergency room visits were reported by the Delaware Department of Health and Social Services during a presentation.[21] We then aggregated these data to quarterly/seasonal counts to match our other metrics. Whether an emergency room visit is related to a drug overdose is determined using syndromic surveillance definitions found in the National Syndromic Surveillance Platform. Non-fatal overdose emergency room visits are expressed as cases per 10,000 emergency room visits given the format in which these data were made available.

Analytic Strategy

Our analysis begins with descriptive statistics of yearly trends spanning 2016 to 2020 and subsequently analyzes seasonal variation within the three overdose measures. As such, the seasons are winter (January, February, March), spring (April, May, June), summer (July, August, September), and fall (October, November, December). We use the Analysis of Variance (ANOVA) approach to test whether within-year variations have a significant impact on the variability of Delaware's overdose metrics, controlling for annual variations. ANOVA partitions the variability in each of the overdose metrics into components that are caused by the factors tested (years and quarters). The contribution of each component to the total variability in the metrics is then tested for significance.[22,23] The analysis assumes the model fits the data well and the errors are normally and independently distributed with mean zero and constant, but unknown variance.[24] Violations of assumptions and model adequacy were evaluated through the examination of probability distributions of the overdose metrics and residual plots of the fitted model (i.e., normal quantile plots, distribution of residuals over time, residual vs predicted values plot). Visual inspection as well as additional statistical indicators indicate normal distributions of residuals and compliance with all modelling assumptions.

As an omnibus test, ANOVA helps us to detect the impact of within-year variations on the overdose metrics, but further analyses need to be performed to answer the following questions. First, which quarters/seasons differ significantly from the overall mean of the respective response variable? Second, which quarters/seasons differ from each other? The first question is answered using the Analysis of Means (ANOM) approach. It identifies quarters with means that differ significantly from the overall mean of all quarters, with annual variations controlled. The second question is answered using Tukey's honestly significant difference (HSD) method.[25] It performs all pairwise comparisons between the quarterly means using the q-distribution (i.e., the exact sampling distribution based on the largest differences of two means from the same population). Controlling for annual variations, our analysis approach allows us to determine not only which quarters/seasons are significantly different from the Delaware average, but also whether they are significantly different from each other. For example, controlling for annual variation, we can determine whether the months of Q3, which includes two of the warmer/summer months of the year, are significantly different from the Q4, Q2, or Q1.

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Results

Yearly Trends in Overdose-Related Metrics

Figure 1 shows a steady and rising trend for all three overdose-related metrics for 2016 and 2017. However, these trends start to diverge in 2018. Between 2018 and 2019, both calls for service and total overdose deaths continue to increase—though at a smaller rate than in previous years. At the same time, non-fatal overdose emergency visits began to decline—down 6.0% from 2018 to 2019—and continued to decline from 2019 to 2020 at a rate of 15.0%. Between 2019 and 2020, calls for service also slow down and start to decline. Specifically, despite yearly increases ranging from 118.0% (2016-2017) at the highest and 4.0% (2018-2019) at the lowest increase, the trend in calls for service declined by 7.0% from 2019 to 2020. On the other hand, overdose deaths continued to increase between 2019 and 2020, but at a smaller rate than previous years. Specifically, there was a 3.0% increase in overdose deaths from 2019 to 2020 compared to the 8.0% (2018-2019), 16.0% (2017-2018), and 13.0% (2016-2017) increases in the previous ones.

Overall, overdose deaths are the only measure to increase consistently across the time-period under observation, with deaths ranging from 306 in 2016 to 446 in 2020. As these trends suggest, there is considerable yearly variation in calls for service to police, non-fatal overdose emergency department visits, and overdose deaths. That is, the trends across these measures are not parallel; they do not share a similar pattern from year-to-year during the 2016 to 2020 timeframe. It is these divergences that we explore further next through a within-year seasonal analysis.

Figure 1. Yearly Trend and Percentage Change of Overdose-Related Metrics (2016-2020)

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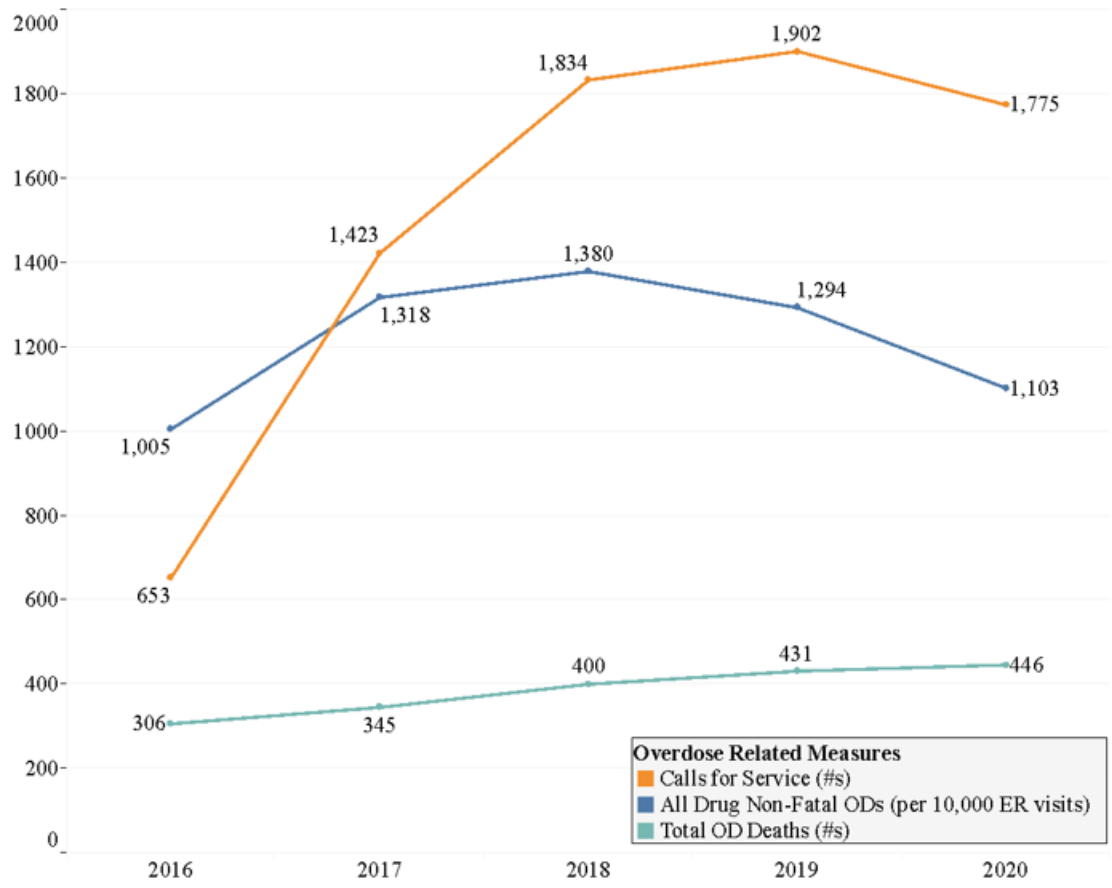

	Yearly Percentage Change			
	2016 to 2017	2017 to 2018	2018 to 2019	2019 to 2020
Calls for Service	118	29	4	-7
All Drug Non-Fatal ODs	31	5	-6	-15
Total OD Deaths	13	16	8	3

Figure 2 displays seasonal variations in the three overdose-related metrics by year. Specifically, each seasonal data point reflects its three-month average value for its respective year. The flat and solid straight lines running through each square of Figure 2 represent the overall mean ($\bar{x}$) of each variable (i.e., overdose deaths = 32.13 per month, calls for service = 101.65, and non-fatal overdose emergency visits = 126.5). Monthly average values of the response variables for each season are shown using a straight dashed line and the 95% confidence intervals of each average are represented by the grey bands. The upper and lower confidence limits are mentioned at the respective boundaries of the bands. Thus, as an example, the average calls for service for overdoses is 105.3 in the winter (January, February, and March), and 162.2 is the upper limit of this average while 48.3 is the lower 95% confidence limit.

Figure 2 shows quarterly differences in the three overdose-related metrics. For the Winter, (January, February, March), non-fatal drug overdose emergency visits increased in the early years (2016 and 2017) but declined and leveled-off by 2018. In contrast, both overdose calls for services and deaths increased in the winter, except for a slight decline for both from 2018 to

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2019. That said, overdose deaths during the winter have increased to the point of falling slightly beyond the upper-95% confidence interval for this quarter. As for spring (April, May, June), non-fatal overdose emergency visits have been stable since 2017 while the other two estimates have seen increases throughout this quarter. Specifically, calls for service to police have seen an upward trend since 2016, but this appears to be leveling-off some in later years for this season. On the other hand, overdose deaths in the spring have been rising since 2017, and this upward trend appears more substantial than calls for service and overdose deaths in this quarter of 2020, escalating beyond the upper limit of the 95% confidence interval again. Moving onto summer (July, August, September), all three measures increased early on but have leveled-off or even declined since 2018. Specifically, overdose deaths in the summer have been stable since 2018, non-fatal overdose emergency visits have been declining since 2018, with calls for service declining in 2019 after steadily increasing before then.

Finally, fall (October, November, December) has seen increases and declines in all three measures over the years of study. Both calls for service and non-fatal overdose emergency visits increased substantially between 2016 and 2017 but remained fairly stable afterwards. On the other hand, overdose deaths did not spike upwards in the winter until 2019. However, all three overdose measures declined significantly between 2019 and 2020 during the winter, suggesting that this season is not as problematic in overdose-related measures in Delaware compared to studies from other locations.[9,12] Overall, the spring months (Q2) report increases in calls for service and overdose deaths beyond the other seasons. However, winter has also seen increases in both of these measures for most years.

Figure 2. Seasonal Overdose-Related Metrics by Year (2016-2020)

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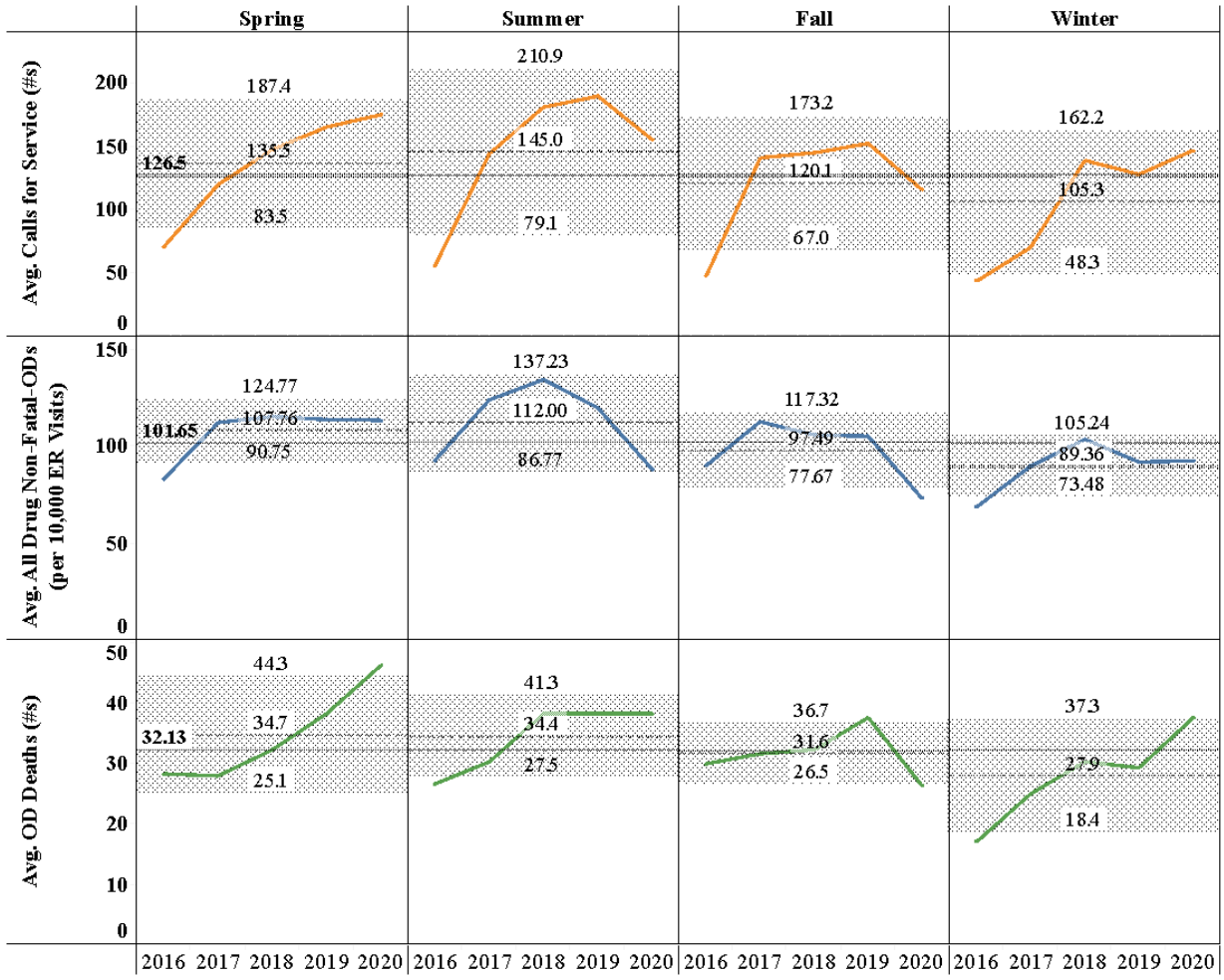

Table 1. ANOVA Results Assessing Differences across Years and Seasons

	Years (p-value)	Seasons (p-value)
Total OD Deaths	0.0003***	0.0272*
Calls for Service	<0.0001***	0.0005***
All Drug-Non-Fatal ODs	<0.0001***	<0.0001***

* p<.05 **p<.01 ***p<.001

We also explored the degree to which the seasonal measures varied from their overall mean. Regarding overdose deaths, we find that only the winter is significantly lower than the overall

average at the 95% confidence level while the remaining seasons are not significantly different from the average. As for calls for service and non-fatal overdoses emergency visits, both are significantly higher in the summer, but significantly lower in the winter when compared to their respective means. In sum, these findings support the variation we saw in the trends from Figures 1 and 2. While the results discussed so far are notable in and of themselves, we now turn to which quarters are significantly different from each other (see Table 2).

Table 2. Tukey's HSD Results Assessing Differences between Specific Seasons

		Total OD Deaths	Calls for Service	Non-Fatal OD
Winter	Spring	0.0383*	0.0110*	0.0008***
Winter	Summer	0.0499*	0.0005***	<.0001***
Winter	Fall	0.4348	0.3951	0.2748
Spring	Summer	0.9995	0.7374	0.7781
Spring	Fall	0.6008	0.3598	0.1112
Summer	Fall	0.6681	0.0478*	0.0106*

* p<.05 **p<.01 ***p<.001

Pairwise comparisons between the seasons, using Tukey HSD, enabled us to uncover significant variations at the 95% confidence level. When comparing winter and spring, we found overdose deaths, calls for service, and non-fatal overdose emergency visits all differ significantly between these two seasons. Similarly, when comparing winter and fall, we again found significant variation across all three measures. When comparing fall and winter, we found differences in two of the three overdose measures. Specifically, calls for service to police for overdoses and non-fatal overdose emergency visits significantly varied between fall and winter, while total overdose deaths did not vary significantly between these two seasons. On the other hand, when comparing winter with spring, summer and fall, and spring with winter, there were no significant differences for any of the three overdose-related measures.

Discussion

Within-year trends have been a topic of public health and safety scholarship over time for many behavioral health outcomes. There is significant value in studying within-year variations to help create effective policies and interventions to halt today's stubborn opioid epidemic. Yet, this existing literature has important gaps. In this study, we sought to address these gaps by investigating seasonal variations in three overdose metrics across a five-year period.

Our study reports yearly differences between the three overdose-related metrics we studied, suggesting they are separate but related phenomena. For example, the trendline divergence of emergency room mentions and police service calls for overdoses from overdose deaths (since 2018 and 2019) suggests the independent nature of these three metrics in recent years. From these data, we might alternatively ask if overdoses are slowing down as even the overdose death metric reported a modest uptick (i.e., 3%) in 2020 compared to previous years.

Next, we found significant differences in within-year or seasonal variation in the three overdose-related metrics we studied, which is another indication that they are independent phenomena. We found the number of overdose emergency room visits, police calls for service, and deaths was consistently lower in the winter months compared to the spring and summer, but not compared to

fall. Summer consistently reported the highest averages for all three metrics across the years we studied, with a small exception for spring overdose deaths. Even though summer reported the highest seasonal averages across the years we studied, summer averages were only significantly different from the winter for all three metrics and from the fall months for two of the three metrics studied.

Public Health Implications

The findings reported from our study have implications for public health and safety efforts underway in Delaware and beyond to combat its opioid crisis. The yearly decline or slowing of overdose metrics in the state since 2016 may offer support for some of Delaware's efforts in addressing the problem, including its reformation of prescription drug monitoring program (PDMP) laws and opioid prescribing practices; its expansion of naloxone distribution and medications for opioid use disorders; and its partnerships between public health and law enforcement agencies to divert individuals with substance use disorders to treatment instead of the criminal justice system. Yet, as we begin seeing a rise in opioid use in combination with other drugs (e.g., cocaine and methamphetamines),[26–30] Delaware should expand existing efforts to address poly-drug use. Further, the results here also suggest that state officials may want to expand and focus these interventions and others in the summer months since that season presents the greatest risk of overdose in the state. This may be challenging since the summer often marks the end of the fiscal year and a period when many, including first responders and others, take vacation.

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