Are Holidays or Festive Periods to blame for Seasonal Spikes in Road Traffic Accidents in Nigeria?

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Over the years, citizens have characteristically viewed festive and holiday seasons in Nigeria as a period when there are spikes in traffic and road crashes. These spike in road crashes have been ascribed to some spiritual or mystical powers which often possess the road ways especially the intercity or highways within the country. The paper examined the impact of holiday and festive periods on the recorded road traffic accident cases in Nigeria for a period ten years (2012 – 2021) using weekly data obtained from the Federal Road Safety Corps Office, the research adopted exploratory data analysis conducted on the Road Traffic accidents data suggests that the data is not normally distributed (Shapiro-Wilk = 0.94, p = .002) hence Kruskal-Wallis test -a non-parametric statistics equivalent of Analysis of Variance (ANOVA) was adopted for test of difference. The aim was to isolate the actual period when road accidents occurred most between ordinary day, non-festive holiday and festive holiday periods. National holiday and festive dates were marked on the data sheet and a hypothesis was tested. A Kruskal-Wallis test was conducted to compare the median ranks of three groups: Festive Holiday, Non-holiday, and Non Festive Holiday. The test revealed a significant difference among the groups ($\chi 2(2) = 11.02$, $p = .004$.). Post hoc tests using the Dunn-Bonferroni method showed that Festive Holiday (FH) and Non-holiday (NH) groups had a significantly different median rank (KW = 58.38, Mdn_FH = 220, Mdn_NH = 180, adj.p = .007). Similarly, the Festive Holiday and Non Festive Holiday (NFH) groups had a significantly different median rank (KW = 84.16, Mdn_FH = 220, Mdn_NFH = 177.5, adj. p = .017). However, there was no significant difference in median rank (Mdn) between Non-holiday and Non Festive Holiday groups (KW = 25.77, Mdn_NH = 180, Mdn_NFH = 177.5, adj. p = .948). The study concluded that most road traffic accidents occur during festive holidays.
Keywords: Road Traffic Accidents, Holiday, Non-Holiday, Festive holiday

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INTRODUCTION

Road traffic accidents represent a significant public health problem worldwide, resulting in injuries, deaths and economic losses. Studies have consistently shown that RTA rates are seasonal, with different accident patterns at certain times of the year. Understanding the factors that contribute to this seasonality and the impact of holidays on crash rates is critical to improving road safety measures and crash prevention strategies. Evidence of seasonality in RTA data is well documented in the literature. Alireza (2013) identified weather conditions, particularly those related to winter, as a significant factor in the seasonality of accidents. Winter weather, characterized by adverse conditions such as ice and snow, results in higher accident mortality rates. Iwok (2016) highlighted that behavioural factor, which are often overlooked in time series analyses, also play a role in the seasonality of RTAs.

A notable seasonal trend observed in the literature is the occurrence of accidents during ember months, which include September to December (Baloye & Palamuleni, 2017). Ojeniyi *et al*. (2015) reported that September in particular recorded the highest accident frequency. This trend is consistent with the idea that accidents are more common during this period (Baloye & Palamuleni, 2017). In addition to seasonality, studies have also examined the influence of weekends and holidays on RTA prices. Phil (1989) and Solanki and Mittal (2016) found that weekends, particularly Saturdays, were associated with higher accident rates. These results suggest that behavioural factors related to weekend leisure activities and relaxation contribute to increased accident rates. Holidays were also associated with increased RTA rates. Anowar (2012) reported that accidents resulting in death and personal injury are overrepresented during vacation. Celik and Oktay (2014) conducted a study in Turkey and found a statistically significant increase in the number of traffic accidents during official holidays. Similarly, Wiratama *et al*. (2021) found that road accidents on public holidays in the UK are more likely to result in death or serious injury compared to non-holiday days.

However, there are conflicting reports in the literature. Bruce (2016) analysed Australian road fatality data and found no evidence of an increase in road fatalities during the Christmas or Easter periods. Anowar et al. (2010) examined holiday crashes in Alberta and found a decreasing trend in the risk of traffic fatalities during the holidays. While holidays appear to influence RTA rates, it is important to further investigate which specific holidays have a greater impact. Arnold and Cerrelli (1987) conducted a study to identify specific holidays associated with increased traffic fatalities. A procedure was presented that is useful to forecast the expected fatality count for each upcoming holiday period. The number of fatalities to be expected on a particular holiday can be roughly forecast by using the averages observed during 1975-1985. The forecast is the product of three quantities: the average for that holiday relative to its weekday, the average for that weekday relative to all days of its month, and 11-year average. The experience of the l1-years shows that the average Memorial Day produces about 23% more fatalities than does the average other days in the month of May of the same year. However, research of this nature is limited in Nigeria.

The conflicting findings in the literature emphasize the need for further research, especially in the Nigerian context, to identify the types of holidays that have a more significant effect on RTA rates. Such investigations are crucial for developing targeted road safety measures and accident prevention strategies that can help reduce the burden of RTAs and save lives. Road traffic accident is one of the leading causes of injuries and deaths worldwide. In Nigeria, there are a lot of myths associated with it. Some believe that accidents are caused by bad luck or evil spirits especially at certain calendar period called “ember months”. The focus of this study is to determine the actual period when road accidents occurred the most, differentiating between ordinary days, non-festive holidays, and festive holidays. This present study is conducted in response to the need to identify the specific types of holidays that record the highest RTA. The objective is therefore to find out if there is any significant difference in the RTA between ordinary days, festive holidays and non-festive holidays with a view to isolating the holiday type recording highest RTA cases.

RESEARCH METHODOLOGY

For this study, a 10-year weekly secondary data (2012 - 2021) was extracted from the weekly RTA reports from the 36 States and the Federal Capital Territory from the database of the Federal Road Safety Corps (FRSC) Headquarters, Abuja. The focus of this study is to determine the actual period when road accidents occurred the most, differentiating between ordinary days, non-festive holidays, and festive holidays. The Organisation defined a week of seven days as that which starts on a Friday and ends on a Thursday. In identifying the week that a public holiday falls, two steps were followed. First, all the official public holiday dates were obtained and tabulated as shown in Table 1 and second, the week start and weekend days for weeks 1 – 53 for the 10 years period, resulting in 525 rows of data, were accordingly computed and properly tabulated. Consequently, the first week of 2012 starts on Friday, December 30, 2011, and ends on Thursday, January 5, 2012 while the last week of 2012 (Week 53) starts on Friday, December 28, 2012, and ends on Thursday, January 3, 2013.

In similar manner, the first week of 2013 begins on December 28, 2012 and ends on January 3, 2013, i.e. week 1 of 2013. The last week of 2013 begins on December 27, 2013 and ends on January 2, 2013 .2014, i.e. week 1 of 2014. The last week of 2019 (week 52) includes the last two days of 2019 and the first five days of 2020. The last week of 2020 (Week 52) includes the last four days of 2020 and the first three days of 2021, as the ISO weekly system allows up to three days of the following year to be included in the last week of the current year.

Table 1: National Holidays from 2012 – 2021

Holiday	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
New Year Day	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan
President Buhari Re-Election Campaign								21-Jan		
Election Day								22-Feb		
Id el Maulud	05-Feb	24-Jan	13-Jan	02-Jan	12-Dec	01-Dec	20-Nov	09-Nov	29-Oct	19-Oct
Id el Maulud holiday							21-Nov	11-Nov		
Good Friday	06-Apr	29-Mar	18-Apr	03-Apr	25-Mar	14-Apr	30-Mar	19-Apr	10-Apr	02-Apr
Holy Saturday	07-Apr	30-Mar	19-Apr	04-Apr	26-Mar	15-Apr	31-Mar	20-Apr	11-Apr	03-Apr
Easter Sunday	08-Apr	31-Mar	20-Apr	05-Apr	27-Mar	16-Apr	01-Apr	21-Apr	12-Apr	04-Apr
Easter Monday	09-Apr	01-Apr	21-Apr	06-Apr	28-Mar	17-Apr	02-Apr	22-Apr	13-Apr	05-Apr
Workers' Day	01-May	01-May	01-May	01-May	01-May	01-May	01-May	01-May	01-May	01-May
Swearing in	29-May	29-May	29-May	29-May	29-May	29-May	29-May	29-May	29-May	29-May
Democracy Day	12-Jun	12-Jun	12-Jun	12-Jun	12-Jun	12-Jun	12-Jun	12-Jun	12-Jun	12-Jun
*Eid el Fitr	20-Aug	08-Aug	28-Jul	17-Jul	05-Jul	26-Jun	15-Jun	04-Jun	24-May	12-May
*Eid el Fitr				18-Jul	06-Jul	27-Jun	16-Jun	05-Jun	25-May	13-May
*Eid el Fitr holiday	21-Aug	09-Aug	29-Jul	19-Jul			17-Jun		26-May	
*Eid el Fitr holiday							18-Jun			
Independence Day	01-Oct	01-Oct	01-Oct	01-Oct	01-Oct	01-Oct	01-Oct	01-Oct	01-Oct	01-Oct
Eid el Kabr	20-Oct	15-Oct	06-Oct	24-Sep	12-Sep	02-Sep	21-Aug	12-Aug	30-Jul	20-Jul
Eid el Kabr holiday		09-Aug	07-Oct	25-Sep	13-Sep	03-Sep	22-Aug	13-Aug	31-Jul	21-Jul
Christmas eve	24-Dec	24-Dec	24-Dec	24-Dec	24-Dec	24-Dec	24-Dec	24-Dec	24-Dec	24-Dec
Christmas Day	25-Dec	25-Dec	25-Dec	25-Dec	25-Dec	25-Dec	25-Dec	25-Dec	25-Dec	25-Dec
Boxing day	26-Dec	26-Dec	26-Dec	26-Dec	26-Dec	26-Dec	26-Dec	26-Dec	26-Dec	26-Dec
Christmas Day off										27-Dec
Boxing Day off										28-Dec
New Year Eve	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec

**It should be noted that particular days of religious festivals vary from year to year, holidays are usually declared for more than one day. If the day falls on a weekend, government often declares next two working days as holidays. Hence, such holidays like Eid, Easter and Christmas holidays occur in more rows in the Table unlike fixed holidays like Workers' (May 1), and Independence (October 1) days*

Thus, the New Year (January 1, 2012) falls in Week 1 that lies within December 30, 2011 - January 5, 2012 (Table 2). Similar Tables were constructed for the other years. Thus, we found that January 1 of 2015 fell within Week 53: December 26, 2014 - January 1, 2015 and so on. As a result of this system of dating, some years have 52 weeks while others have 53 weeks. In the data table, a variable "festive week" was created in which Weeks 1 – 53 were identified as festive holiday week, non-festive holiday week and non-holiday week.

It was assumed that people do not travel on the exact days of the holiday, but they do so few days to the holiday from their bases and few days after the holiday to return to their bases, especially the non-civil servants. Hence, if a holiday falls within a week, that week is marked as holiday week. A preliminary exploratory data analysis conducted on the Road Traffic accidents data suggests that the data is not normally distributed (Shapiro-Wilk = 0.94, $p = .002$) hence Kruskal-Wallis test -a non-parametric statistics equivalent of Analysis of Variance (ANOVA) was adopted for test of difference.

Table 2: Days that fall within each of Week 1 to Week 52 in 2012

- Week 1: **December 30, 2011 - January 5, 2012**	- Week 20: May 11 - May 17	- Week 39: September 21 - September 27
- Week 2: January 6 - January 12	- Week 21: May 18 - May 24	**- Week 40: September 28 - October 4**
- Week 3: January 13 - January 19	**- Week 22: May 25 - May 31**	- Week 41: October 5 - October 11
- Week 4: January 20 - January 26	- Week 23: June 1 - June 7	- Week 42: October 12 - October 18
- Week 5: January 27 - February 2	**- Week 24: June 8 - June 14**	**- Week 43: October 19 - October 25**
- Week 6: **February 3 - February 9**	- Week 25: June 15 - June 21	- Week 44: October 26 - November 1
- Week 7: February 10 - February 16	- Week 26: June 22 - June 28	- Week 45: November 2 - November 8
- Week 8: February 17 - February 23	- Week 27: June 29 - July 5	- Week 46: November 9 - November 15
- Week 9: February 24 - March 1	- Week 28: July 6 - July 12	- Week 47: November 16 - November 22
- Week 10: March 2 - March 8	- Week 29: July 13 - July 19	- Week 48: November 23 - November 29
- Week 11: March 9 - March 15	- Week 30: July 20 - July 26	- Week 49: November 30 - December 6
- Week 12: March 16 - March 22	- Week 31: July 27 - August 2	- Week 50: December 7 - December 13
- Week 13: March 23 - March 29	- Week 32: August 3 - August 9	- Week 51: December 14 - December 20
- Week 14: March 30 - April 5	- Week 33: August 10 - August 16	**- Week 52: December 21 - December 27**
- Week 15: April 6 - April 12	**- Week 34: August 17 - August 23**	**- Week 53: December 28, 2012 - January 3, 2013**
- Week 16: April 13 - April 19	- Week 35: August 24 - August 30	
- Week 17: April 20 - April 26	- Week 36: August 31 - September 6	
- Week 18: April 27 - May 3	- Week 37: September 7 - September 13	
- Week 19: May 4 - May 10	- Week 38: September 14 - September 20	

National public holidays are in bold face

RESULTS AND DISCUSSION

Annual RTA trend (2012 – 2021)

A total of 106,789 RTA cases were recorded during the 10-year study period of 2012 to 2021. The annual trend reveals a high incidence of RTA from 2012 to 2014, a downward trend from 2015 to 2018 and a spike from 2019 to 2021.

Table 3: Descriptive Statistics of the Annual RTA Rates (2012 – 2022)

Year	Median	Mean	Std. Deviation	Minimum	Maximum	Sum
2012	365	365	77	162	718	19004
2013	256	256	29	207	367	13319
2014	197	196	34	121	336	10203
2015	164	165	27	87	237	8767
2016	161	161	28	36	248	8559
2017	154	153	25	101	223	7931
2018	156	155	36	14	280	8218
2019	186	188	43	18	299	9955
2020	198	199	56	73	317	10531
2021	197	198	30	147	279	10302

Weekly Trend

A downward trend in RTA can be noticed between Week 1 and around Week 316 where the trend starts a gradual upward movement.

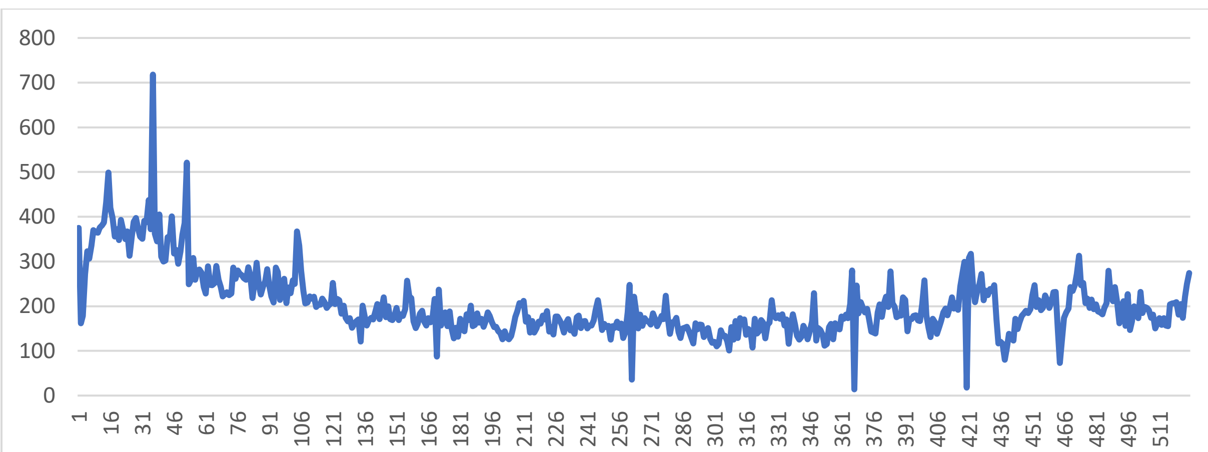

Figure 1: Weekly RTA trend from 2012 – 2021

Distribution Pattern of the RTA Data

When partitioned into festive holiday, non-festive holiday and non-holiday weeks, the distribution pattern of RTA shows the presence of outliers in the data. However, the festive holiday week's data is fairly normally distributed with mean almost equal to median compared to the non-festive holiday and non-holiday weeks as shown in Figure 2.

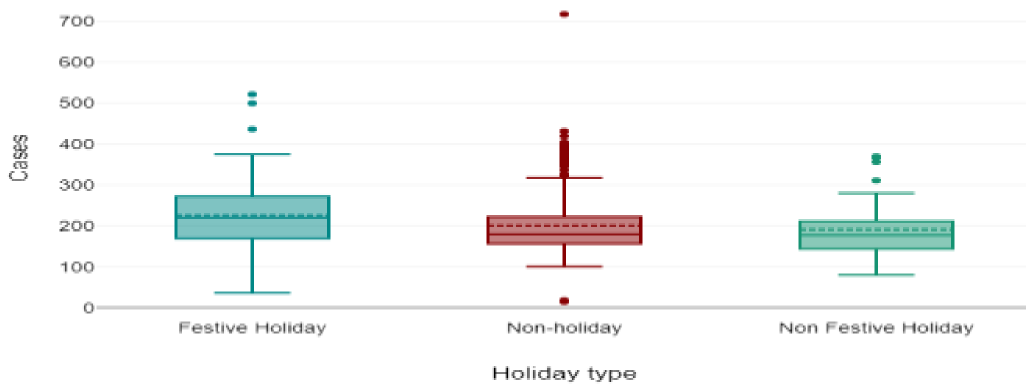

Figure 2: Distribution of RTA cases for time periods (2012 – 2021)

Relationship between RTA during Holiday and Non-Holiday Periods

The weeks in the study time period (2012 – 2021) were partitioned into three periods: Non-Holiday, Festive Holiday and Non-Festive Holiday and a hypothesis was set up to test for significant difference in the RTA cases in the three periods.

Hypothesis testing

H_O: There is no statistically significant difference in the road traffic accident cases among the three categories of periods.

Descriptive statistics yielded by the Kruskal-Wallis analysis shows that the festive holiday weeks have a higher median value (220) than non-holiday (180) and non-festive holiday (177.5) periods.

Table 4: RTA rates in the three periods

Groups	n	Median	Mean Rank
Festive Holiday	73	220	315.13
Non-holiday	414	180	256.75
Non-Festive Holiday	38	177.5	230.97
Total	525	182	

A Kruskal-Wallis test was conducted to compare the median ranks of three groups: Festive Holiday, Non-holiday, and Non Festive Holiday. The test revealed a significant difference among the groups ($\chi2(2) = 11.02$, $p = .004$).

Post hoc tests using the Dunn-Bonferroni method were then conducted to determine which pairs of means were significantly different from each other after the Kruskal-Wallis test (KW). The results showed that Festive Holiday (FH) and Non-holiday (NH) groups had a significantly different median rank (KW = 58.38, Mdn_FH = 220, Mdn_NH = 180, adj.p = .007). Similarly, the Festive Holiday and Non-Festive Holiday (NFH) groups had a significantly different median rank (KW = 84.16, Mdn_FH = 220, Mdn_NFH = 177.5, adj. p = .017). However, there was no significant difference in median rank (Mdn) between Non-holiday and Non-Festive Holiday groups (KW = 25.77, Mdn_NH = 180, Mdn_NFH = 177.5, adj. p = .948).

Previous studies have identified "Ember months", that is, the last four months of the year (Ukibe *et al*., 2011; Omobowale *et al.,* 2011) as the most critical period while other studies pointed out to holiday periods (Anowar *et al.,* 2021) while others argued in favour of holiday periods (National Safety Council (2023) or specifically festive periods (Oyenuga *et al.,* 2006). This paper considered all the suggested periods and tested for the difference in the RTA cases during Festive Holiday, Non-holiday, and Non-Festive Holiday and found a statistically significant difference.

The results showed that there was a significant difference between festive holidays (FH) and non-holidays (NH). Likewise, the "Festive Holidays" and "Non-Festive Holidays" (NFH) groups had a significantly different median but no significant difference between non-holiday and non- festive holiday periods. This conclusion has thus pinpointed festivities as the undisputable factor responsible for high cases of RTA in Nigeria. The rise in RTA cases during the festive holiday season, as noted by Omobowale *et al.* (2011) is connected to the desire by merchants and transporters to earn additional money resulting from increase in economic activities.

Table 5: Dunn-Bonferroni test

	Test Statistic	Std. Error	Std. Test Statistic	p	Adj. p
Festive Holiday - Non-holiday	58.38	19.26	3.03	0.002	0.007
Festive Holiday - Non-Festive Holiday	84.16	30.34	2.77	0.006	0.017
Non-holiday - Non-Festive Holiday	25.77	25.71	1	0.316	0.948

Adj. p: Values adjusted with Bonferroni correction

CONCLUSION

The study provided empirical evidence to support the notion that festive holidays in Nigeria are associated with a higher frequency of road traffic accidents. Despite the significant finding, a daily rather than weekly data that would have allowed the specific accidents rates few days before, during and after a festive day would have been more useful. It should be noted that, apart from the drivers' discipline or indiscipline, weather condition and state of the roads are crucial factors that also play a role. Therefore, it is important for drivers to be cautious, reducing speed, maintaining a safe distance from other vehicles, and being prepared for unexpected obstacles. By taking these precautions, accidents can be minimized during the festive period. For future studies, a comprehensive accident record indicating the day, weather and road condition should be explored. The results of this study also point to the need for increased awareness, enforcement, and targeted interventions during these peak periods to mitigate the risks associated with road accidents.

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