MAKERERE UNIVERSITY SCHOOL OF PUBLIC HEALTH

REPORT ON

TREND ANALYSIS OF ROAD ACCIDENT OUTCOMES ASSOCIATED WITH ENHANCED TRAFFIC POLICE ENFORCEMENT DURING FIKA SALAMA OPERATIONS ALONG KAMPALA-MASAKA ROAD.

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INTRODUCTION

To date, sub Saharan Africa has one of the worst road injury rates in the world of which, Uganda has one of the worst RTA injury rates on the continent (WHO 2018). In Uganda about 3500 people die due to road traffic accidents (RTAs) and over 12000 others have sustained non-fatal injuries in road accidents every year (UNECE 2018). While there have been numerous traffic interventions to improve road safety, the last decade has nonetheless witnessed a relentless increase in the national accident burden particularly in urban areas and their connecting highways Since 2011, the national road mortality rate has grown by 25.9 % every year and has plateaued at over 3000 deaths per year in the last five years (UNECE 2018). Consequently, this led to over 5.7 RTA hospital admissions per day (UBOS 2016; Uganda Traffic Police Reports 2015; 2018).

According to WHO and UNECE 2017, motor vehicles accounted for over 45% of all seriously injured victims, while most RTA victims have historically been male pedestrians, aged 15 -29 years. Unfortunately, these victims were part of the largest productive age group in Uganda. Hence, preventing RTA injuries not only has direct economic benefits to travellers but also generates huge cost savings to hospitals, their care givers (WHO 2018) and well-being of society as a whole. And while several interventions have been initiated by road traffic police to reduce RTAs, the accident burden is still high and the economic impact of most traffic police interventions remains unknown partly due to their ad hoc nature, limited economic data and limited scope of analysis of the trends of RTA outcomes after such initiatives (WHO 2018).

THE PROBLEM

In Uganda while we know that the national estimations of RTAs has been on the rise for the last decade, the trend of RTAs following selected traffic interventions (like Fika Salama) is often not known due to lack of a reliable and robust accident database that is necessary for simulating the road traffic injury trends for various highways. As such, availability of route-specific data and injury trends is still a challenge and is exacerbated by limited resources for evaluations of traffic interventions, limited road surveys yet the little injury data available is scattered between hospitals and police. As a result, the outcome trends associated with most traffic interventions are poorly documented yet most interventions are either ad hoc or reactionary in nature. Hence, sustainability and predictability of intended scale up of good interventions in case of emergencies is not easy due to absence of synthesized facts and other economic information gaps about RTA injuries on rural highways.

METHODOLOGY

To facilitate trend analysis of RTA outcomes for this study, accident data of two years (2017-2018) was collected to estimate the RTA trends during and after operation Fika Salama. Incidence data about road accidents was collected from health facilities that received RTA victims from one high burden road along Kampala – Masaka road. To estimate the changes in the effect of OFS, monthly incidence data was analyzed in 6 months implementation phases that characterized the 4 implementation periods of Operation Fika Salama. Comparison of plotted data was done for the Phase 0 and Phase 1first, while the other comparison was between the Phase 3 and Phase 4. All the injuries identified in the study, were first categorized by level of severity to determine resource consumption of various RTA patients. In effect, we identified the number of RTA injuries that made single visits (e.g OPD patients) and those that were admitted for several days. This culminated into 5 injury categories namely; minor, moderate, serious, severe and critical injuries. Prior to the trend analysis, the distribution of different across the comparison phases has been presented as pie charts. But for purposes of the trend analysis, all injuries have been converted to one common outcome unit called a Standard unit of Output (SUO) in a manner similar to that used by Ministry of Health and UCMB (UCMB, 2013).

Study Design

This was a costing study that compared cost savings of different implementation periods. It was premised on the notion that the number of RTA injuries and fatalities varied with the intensity of traffic regulation enforcement in each implementation phase. As such the study employed a mixed method approach that included qualitative and quantitative techniques to obtain data about police and all other non-medical inputs.

Organisation of the Fika Salama Police Intervention

After the sudden spike in the incidence of RTAs along Kampala – Masaka highway, Operation Fika Salama (OFS) was launched at the end of July 2016. It began with deployments of 3 check points along the 120 km at intervals of 30kms. Check points were stationed particularly at accident black spots. Each checkpoints a had two teams, namely; 1comprising of 6 policemen and 2 armed personnel that worked during day from 8.00 am – 5.00 pm while another team of 4 policemen and 2 armed men worked at night from 5pm - 7am. They were all assisted by roving patrols of 6 people.

At each check point, motorists were stopped and the validity of their permits was examined , the road worthiness of the vehicles was assessed, drivers were tested for drunken driving as well as their knowledge of the highway code and all culprits were apprehended were detained overnight before being taken to the traffic court. But in case of accidents, the patrol vehicles offered ambulance services and ferried the victims to the nearest hospitals. The initial operation lasted for 6 months before being called off for 6 months. After a fresh spike in RTAs, the operation was reinstated in July the following year as "Fika Salama Reloaded" albeit with less vigor, less funding, no court prosecutions and receipt based express penalties were reinstituted.

Hypothetical illustration of RTA incidence and the implementation of OFS

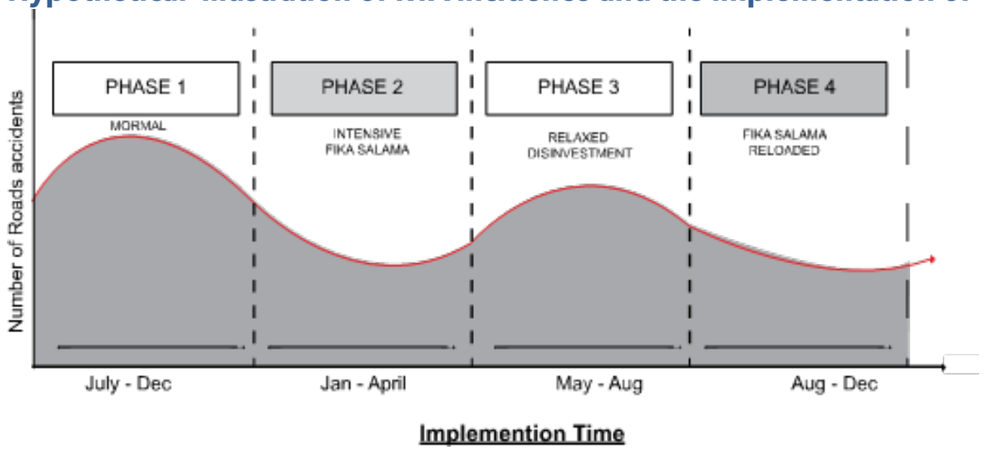

Figure 1. Illustration of the annual RTA incidence rates throughout OFS (Uganda Police reports, 2013- 2016; UBOS Statistical Abstract of 2016 (UBOS, 2016).

Scenarios	Phase 0	Phase 1	Phase 2	Phase 3
Description	Pre Intervention	Intervention	Relaxed	Re-intervention
Intensity of traffic checks	Low (Business as Usual)	Comprehensive checks	Normal	Moderate
Interventions	Laxed traffic enforcement, stationery check points, receipt based penalties.	Vehicle road worthiness checks, validity checks for drivers' licenses, community sensitization, mobile patrols, 24-hour road surveillance, speed checks, sobriety checks; vehicle impounding, overnight apprehension and court trials.	Reduced enforcement, Withdrawal of army, stationery check points, return to receipt based penalties.	Mass traffic sensitization, increased sobriety check points, roving patrols, and expanded, return of stationery check points.
Participants	Traffic police, hospitals	Traffic police, CSOs, UNRA, Army, MOWT, Courts, hospitals	Traffic police, hospitals	Traffic police, Armed guards, hospitals
Injury/Fatality frequency	High	Low	Very low	High
Extra funds	None	High	Very low	Low

i) **Phase (0)** was defined as the **Pre Intervention Phase** that depicted the usual activities which preceded the Fika Salama operation for 5 months, without any special intervention like the one soon after completion of the Masaka – Kampala highway. Impliedly this was the **"Do nothing"** phase and **'Comparator'** for this study.

ii) **Phase (1)** was a pragmatic period of enhanced and strict enforcement of traffic regulations for six (6) months after the OFS launch. This was the climax of Fika Salama.

iii) **Phase (2)** reflected a 5 months of Relaxed between January and June 2017. It was marked by a reduction in the intensity of enforcement activities and it reflected a gradual withdrawal and reduction in enforcement activities and a rebound of accident incidences.

iv) **Phase (3).** This was a 6 month period of renewed intensive enforcement of traffic regulations. The traffic police called it "Fika Salama Reloaded", Most Activities in this phase were similar to those in Phase 1 but it had marked absence of UNRA and the army, reduced roving patrols and re-establishment of highway check points.

The perspective of analysis for police costs was regulatory in nature. It provided insights of costs incurred from an enforcement and implementation view point.

Study Outcomes were the number of Road Traffic Accident (RTA) injuries prevented that were ascertained from the differences in the number of injuries between the phases.

Sites visited: For this study, 8 police stations visited included; Masaka Police, Lukaya (Kalungu) Police, Kayabwe, Buwama, Kammengo, Mpigi, Nsangi, Kampala CPS and Kyengera Police stations. However, due to information gaps available at the time of our visits in some places, additional interviews with more knowledgeable officers were conducted in Masaka hospital, Nkozi hospital, Mulago hospital, Kampala Central Police Stations, Masaka, Nsangi, Kyengera and Lwengo police stations.

Data Collection Methods: For this study, data collection was done using of a mixed method approach. To identify the most optimum phase it included record reviews, in-depth interviews with police experts and quantitative interviews. The study used ingredient and average costing approaches in the identification of police inputs and the number of injuries recorded between 2016 -2017, but also involved identification and estimation of the quantities of the items used in managing RTAs (both) in hospitals and in police stations. The average cost of items with missing cost data was ascertained basing on market prices of JMS, National medical stores, private suppliers and procurement experts. This was attained through reviews of records from hospitals, police, interviews of key hospital or police personnel and inputs from OFS stakeholders that convened at 2 stakeholder meetings. However in costing the injuries, we first categorized the injuries by level of severity to determine resources that were consumed by various RTA patients. Consequently, we identified the number of RTA injuries that made single visits (e.g OPD patients) and those that were admitted for several days. Identification of costs by day of admission was intended to minimize variations in the costs of the procedures and quantities of medicines used on the first day compared to the subsequent days of admission after the occurrence of an RTA, Injuries for single visits were mainly in the minor injury category. An SUO is a composite outcome score used to gauge performance of health entities with multiple outcomes like "Fika Salama". Hence, SUOs were the main outcome measure for this comparative cost analysis. To calculate the number of SUOs, all RTA injuries of various categories were expressed in terms of their outpatient equivalents. Calculation of SUOs was calculated based on the number of **Out-patient equivalents** per injury category especially; **the average length of stay for inpatients and cost of out-patient services a**s recommended by UCMB (UCMB, 2013).

INJURY CATEGORY	WEIGHTS	OP Equivalents* Weights
Minor	1	(No.)Minor*1
Moderate	2	(No.)Moderate*2
Serious	3	(No.)Serious*3
Severe	6	(No.) Severe*6
Critical	20	(No.)ICU*20
Deaths	2	NA

If only variables pertinent to RTA management are considered, and those considered irrelevant (e.g deliveries, immunization, ANC/MCH/FP) are omitted because they add no value,

Then 1 SUO (op-h) = [(Op*1) + (Ip1*2+ Ip2*3+ Ip4*6 + Ip5*20)] and the ***Cost SUO (op-h) = [Cost(Op*1) + Cost(Ip*2) + Cost(Ip*3) + Cost(Ip*6) + Cost(Ip*20)***

Data analysis: To determine the total implementation costs of OFS, we identified and aggregated the non-medical costs incurred by various stakeholders across the different OFS phases. Total cost savings were deduced from the difference in costs incurred in each phase and those of the normal phase. The difference in costs was calculated as a difference in RTAs between the phases being compared. While executing the cost analysis, we intend examine the relationship between the costs and the number of RTAs in each phase. Costs for each phase were profiled using a costing template adapted from CDC (CDC MV PICCS, 2009). This will help identify the phase with most optimal savings and least costs. The results were subjected to uncertainty analysis to identify which costs component contribute greatest to the largest cost savings.

Reference case: Due to resource limitations we intend to conduct the study from only a health care sector perspective. Estimates from a societal perspective will not be presented due to resource limitations and feasibility related challenges.

Study assumptions: To facilitate comparison of costs the study was premised on the assumption that;

1) All emergency admissions required transportation by ambulance to the health facility
2) Each and every RTA related death was reported to Police and loss to follow up was minimal

Financial support from OFS implementing partner institutions was relatively stable and exclusive in each phase, in that no finances were attained in one phase and registered in another phase

RESULTS

Effectiveness of Fika Salama

In this study, the efficacy of the operation was noted by the difference in injuries recorded between each phase and the prior phases. From the results, efficacy not only varied between the injuries of the different phases of Fika Salama, but also varied largely by the number of fatalities recorded in various operation phases as shown in Table 4.

Table 1. Effectiveness of Fika Salama based on effectiveness differences between OFS phases

	INJURY COUNTS			
DURATION	PHASE 0	PHASE 1	PHASE 2	PHASE 3
Minor	316	283	220	380
Moderate	110	113	96	93
Serious	68	76	65	112
Severe	38	47	60	74
Critical	9	7	1	20
TOTAL	541	526	442	679
Deaths	29	5	26	10

Data Source: Primary and secondary hospital data

Considering the incremental effectiveness of all phases, the intervention phases of Fika Salama i.e the Intensive and Reloaded phases registered a sizeable reduction in the number of Critical injuries and fatalities. With a reduction of 83% (24 deaths) in the intensive phase and 65% (19 deaths) in the reloaded phase, the operation far exceeded the annual target of a 50% reduction in fatalities, recommended by WHO (WHO 2018).

OVERALL TREND OF OUTCOMES IN SUOS

Table 2. Effectiveness of OFS phases based on SUOs derived from injury counts.

		DURATION COUNTS (SUO)						
DURATION	PHASE 0 SUO	%	PHASE 1	Percentage Change	PHASE 2	Percentage Change	PHASE 3	Percentage Change
Minor	316	0	283	(10%)	220	22(%)	380	(-72%)
Moderate	3,300	0	3390	(-3%)	2880	15(%)	2790	(3%)
Serious	2,835	0	3420	(-21%)	2925	14(%)	5040	(-72%)
Severe	3,420	0	2115	(38%)	5400	-155(%)	6660	(-23%)
Critical	2,700	0	2100	(22%)	300	85(%	6000	(-95%)
TOTAL	12,571		11,308		11,725		20,870	
Deaths	29	-	5	-	26	-	10	-
Fatality Difference		-	-24	(83%)	-3	-	-19	-

Data source: SUOs were derived from the injury counts in Table 1.

In the results in Table 2,

Trends of RTA outcomes (SUOs) between various phases of Fika Salama

Generally, from the start of OFS in January 2016 up to December 2018, there were major decreases of 38% in the number of SUOs derived from severe and 22% from critical RTA injuries in Phase 1. In Phase 2, a marked decrease of 85% was realized particularly among critical injuries while the SUOs decreased by 23% only among severe injuries in Phase 3. But despite significant reductions that were noticed in phase 1 and 2, there was an SUO increase of 72 % for minor and serious injuries and 95% for critical injuries in

Phase 3. Thus, the annual upward trend of SUOs for the entire intervention period was greatly skewed the overall trend and number of SUOs in the last 6 months of 2017 shown by **Figure 2.**

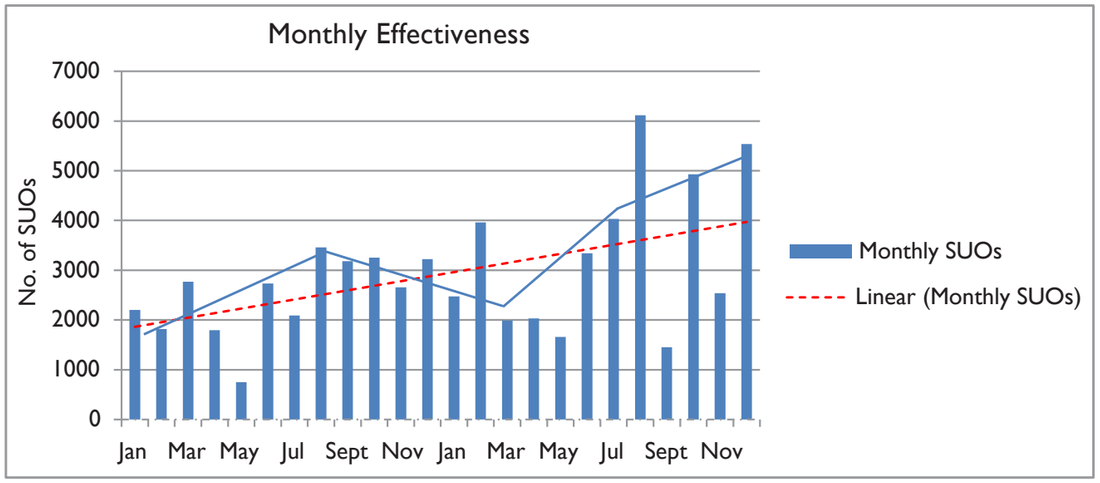

Figure 2 : Trends of RTA outcomes (SUOs) between various phases of Fika Salama

Due to the effect of the Phase 3 (July-December 2017), the effect of OFS was further examined between each intervention phase and the preceding phase.

To identify the trend of RTAs between various phases of OFS, we conducted an interrupted time series analysis (itsa) for a single group intervention without any comparison as guided by Linden A (Linden et al, 2015). As part of this analysis we first compared the outcomes in the (Pre – intervention) phase (0) with those in the (post intervention) phase (1) of OFS. With time and structured status of having an intervention as the main independent variables, the trend in SUOs is depicted in the graph below.

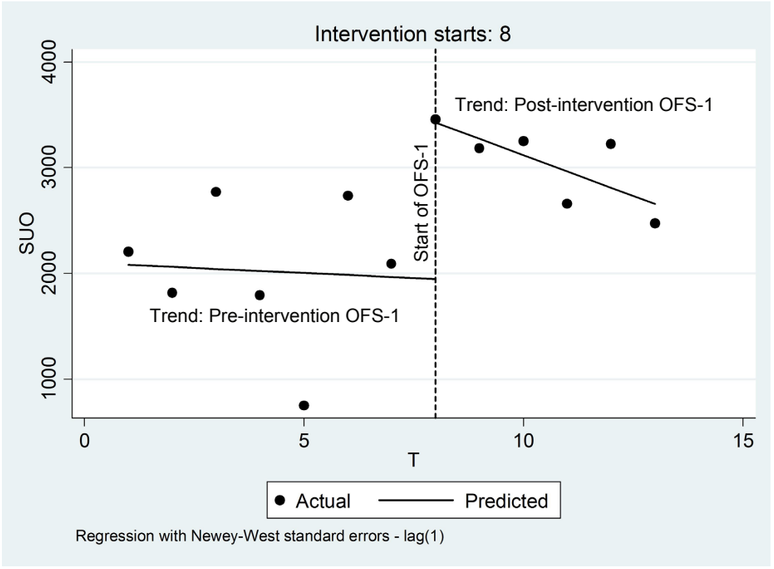

Figure 3: Trend of injuries in OFS participating hospitals during the Phase 0 and Phase 1 of OFS

In the graph above, RTAs were relatively high before any intervention and but markedly increased in the mid-year period of May to July 2016. When Fika Salama was introduced RTAs immediately reduced. As such, soon after starting OFS at te end of July 2019, there was a steady decline in RTAs up to the end of 2016. From the results in Figure 3 above, it is clear that with (RTAs) of the Normal phase generated 2079.5

SUOs at the start, but these decreased in subsequent months. But it should be noted that the first month of the post intervention (intensive) phase was triggered by a statistically significant increase in SUOs of 1479.38 (*P* = 0.013, CI = [394. SUOs slightly decreased every month (although not significantly) by 18.9 SUOs (*P*= 0.805, CI = [−187.35, 149.49]). *00, 2564.76*]) from the Phase 0, it also marked the start of decrease in the monthly trend of SUOs by -134.96 SUO per month (P = 0.137, CI = [−322.22, 52.31]). The results further show that after the introduction of FIKA SALAMA in August, the SUOs decreased by 153.89 (*P* = 0.0017, CI = [−232.89, -74.88]) compared to the Normal phase.

Table 3: Linear regression of Outcomes predictors of the Normal and Intensive phase

Regression with Newey-West standard errors Max lag:1			**Number of Obs = 13 Prob > F = 0.0003**	
SUOs	Co eff	P > | t |	95% Confidence Interval	
Time (month) - t	- 18.93	0.805	- 187.35	149. 49
Intervt.n status - (X)	1479.38	0.013	394.00	2564.76
Time x interv.n status (Xt)	-134.95	0.137	-322.22	52.30
_Constant	2079.5	0.000	1618.97	2540.03
Post Intervention Linear Trend – Lincom estimate				
Treated	-153.89	0.0017	-232.89	-74.88

Post Intervention trend between Relaxed and Reloaded Phases

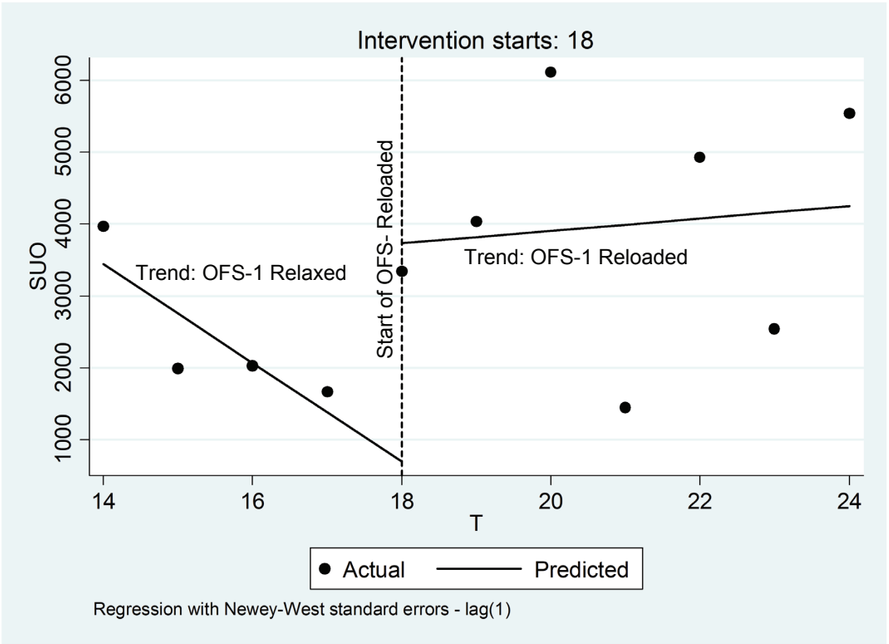

Figure 4: Post Intervention trend between Relaxed and Reloaded Phases

During the Relaxed phase there average number of SUOs per month continued to drop at a rate similar to that of the Intensive phase but experienced upward trend in August that was slowed down in the last quarter of 2017. In the 'Relaxed' period, the average number of SUOs from RTAs continued to drop by 687 every month given p = 0.010 (CI; -1154.27, -219.53). However due to a resurging mid-year rise in the number SUOs, Fika Salama Reloaded was reintroduced in month 18 (July 2017).

During the last intervention period that stretched from July – December 2017, there was a significant increase of 3037.96 SUOs [p=0.000 (2016.42, 4059.50)] when the intervention was reintroduced compared to when Fika Salama had been relaxed. That apart, it is also clear that the Reloaded phase had a non-significant increase of 86.75 SUOs [p=0.45 (-175.43, 348.9)].compared to the relaxed phase as shown in Table 4 below.

Table 4. Linear regression of Outcomes predictors of the Relaxed and Reloaded phases

Regression with Newey-West standard errors **Time variable T: 14 – 24**			**Number of Obs = 11** **Prob > F = 0.0006**	
SUOs	Co eff	P > | t |	95% Confidence Interval	
Time (month) - t	-686.9	0.001	- 995.93	-377.87
Intervt.n status - (X)	3037.96	0.000	2016.43	4059.50
Time x interv.n status (Xt)	-773.65	0.006	306.53	1240.76
_Constant	3442.1	0.000	2848.79	4035.41
Post Intervention Linear Trend – Lincom estimate				
Treated	86.75	0.4596	-175.43	348.93

Overall trend of outcomes

Generally, from the start of OFS in January 2016 up to December 2018, there was an increase in the number of Standard Units of Output realized over the entire operation that was scattered over 24 months. During the implementation massive gains in form of reduced medical inputs were recorded from July 2016 to May 2017. However, an upward linear pattern followed thereafter and largely skewed the overall number of SUOs in the last 6 months of 2017mas shown by Figure 4.

CONCLUSION

All the results above show that, Fika Salama was more effective in Phase (1) or the 'Intensive phase' compared to other phases. The extended effectiveness of OFS realized from Phse 1 to Phase 2 was undermined by accident upheavals particularly in the last 2 months of the Reloaded phase (3) in 2017.

Limitations

Due to design limitations the study could not permit estimation of client, societal and productivity loss costs.

Besides that data limitations could also permit assessment of the effects of seasonal variations particularly in mid and end year periods.

Policy implications

From this study it is evident that;

1. **OFS needed to maintain the combination of elements and vigilance seen in Phase 1.** From an implementation perspective, it also shows that the effects of Phase 1 spilled over to the first 2 months of Phase 2 following the withdrawal of Phase 1.
2. As such, **enhanced traffic regulation enforcement interventions should be done over longer durations** of 6 months with shorter interludes of 4 months since the benefits of regulatory vigilance of OFS continued for 2 more months before resumption of more RTAs.
3) **Periodic initiatives like OFS are very useful especially in times when more RTAs are expected to occur like during holidays, festive and mid-year seasons.**
4. Ways to financing traffic police and interventions like OFS are necessary for UHC goals in order to improve health lives and well-being of the affected populations.
5. The reduction in SUOs between phase1 and phase 2 showed marked reduction of SUOs 1263. These were associated with savings in RTA treatment costs in hospitals estimated at between at **UGX 708,175,447** between Phase 1 and for Phase 2.

Lessons learnt

- Scattered enforcement is effective if it is adequately facilitated and is done at least twice a year.

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SPEED Brief

The Supporting Policy Engagement for Evidence-based Decisions (SPEED) for Universal Health Coverage in Uganda is a 5 year partnership supported by European Union that started in 2015. The partnership comprises Makerere University School of Public Health (Lead Agency), Uganda National Health Users Consumers' Organization (UNHCO), Economic Policy Research Centre (EPRC), National Planning Authority (NPA), Institute of Tropical Medicine (ITM) Antwerp Belgium and Human Science Research Council (HSRC), South Africa.

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