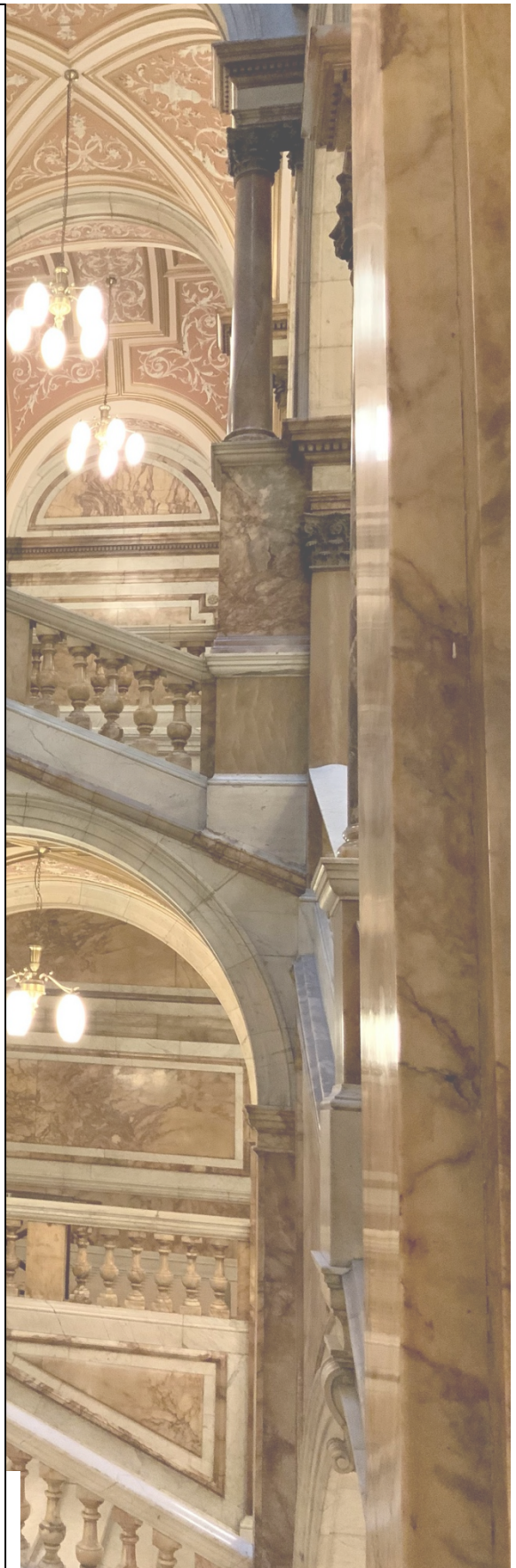# APPRENTICESHIP REPORT 2020

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CHIEF EXECUTIVE DEPARTMENT

REPORT TO HEALTH & SAFETY

10TH FEBRUARY 2020

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BUSINESS CHALLENGE

Over the last 3 years HANDS has significantly invested financial resources to introduce an electronic incident reporting tool (HandS System) which holds incident/accident data (approx. 10,000 entries onto system per year) in addition to staff H&S training records, and fire risk assessments.

Despite, thus far, Health & Safety department are unable to effectively utilize the information contained within the system to provide quality reports to allow informed decision making for management in the form of creative data visuals such as infographics, heat mapping, etc.

EXPECTED OUTCOME

To produce informed, engaging, correlative reports stemming from the HandS System into a central depository, improving on how to present data that will allow services to track performance in their respective Service/Area of business which in turn will provide improved Health & Safety performance and change the way of presenting the information across the council family.

1. INTRODUCTION

The objective of the report is to the give Health & Safety department of the Glasgow City Council a comprehensive analysis of inter-related and underlying factors of Council and School incidents for the year 2018 and 2019. The report has been designed keeping in mind to recreate the traditional data representation of the Council. Anon, (2020). This will help H&S to ensure that their decisions are properly directed with reference to the datasets and also endorse the utilization of the new data visuals for a better understanding.

Furthermore, the report also highlights the core issues faced by the Data/Business Analysts using HandS system to extract the relevant information for plotting Data Visuals.

2. PROBLEMS FACED DURING THE DATA ANALYSIS

In this business challenge, there are some certain key factors which influence inaccuracy in analyzing the data and incompetent nature of the data charts. To increase the accountability, predict trend settings and make decisions on overall performances by the Service/ Area of business, it is crucial to make the data-sets accurate and balanced in order to plot the charts. The cleansing, considering, and sorting of the data has been done during the second week of the apprenticeship program followed by applying Statistical Models in SPSS. Some of the key problems were:

- **Data Collection** – The HandS collection data system automatically collects the data and organizes information but there are many data entry fields that needs to enter manually and therefore the process is time-consuming for the managers. The Biggest Disadvantages of Manual Data Entry (2020) This often led to frustration or monotonous behavior that can further results in typo errors, irrelevant name shortcuts, blanks cells, or misplaced entries.

  Solution – Introduction of drop-down list, click & select, or choose options can be initiated for the collection of the meaningful and real-time data. One can make the data fields mandatory to avoid the missing values.
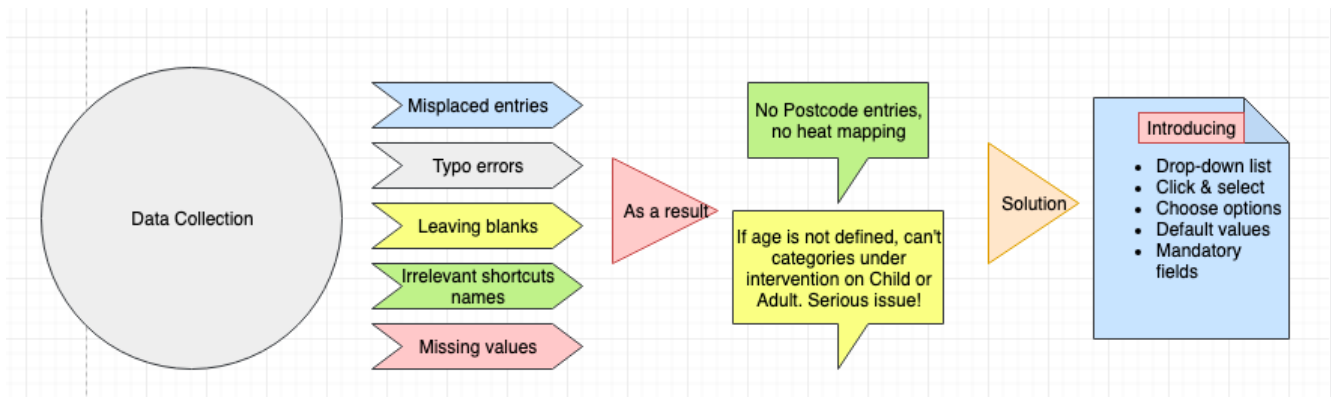
Figure 1: New methodology to collect meaningful and real-time data

- **Data consideration and cleansing-** While going through the datasets there were many multiplication/duplications of the data. In the HandS system there are two categories for the same info, "Fire services attendance" and multiple categories for the "Address". Also, the data are misplaced in the most atrocious manner. For example:

	A	B	C	D
1	Ref no.	Date	School or Council	Did incident happen on a Council
2	12345	04-Jan-18	School Incident	Yes

Table 1: Mixing of the data information

There are thousands of entries similar to the example above that can be found in the database and thereby increasing the higher risk of incorrect data manipulation. It can take ages for the data analyst to clean, sort and correctly manipulate the data to attain exactness.

- **Visual representation of the data** – In order to comprehend the data and make it more impactful, the data needs to be presented in the most engaging graphical format that can be easily understood by the managers even in case if they are not from technical background. In this business challenge several Visualization software has been used such as SAP Lumira, Tableau, draw.io, online visual paradigm and Microsoft Power BI.

- **Missing value analysis (MVA)** was conducted to study 'missing-ness' and the pattern of the 'missing-ness' of the data, MCAR or MCR, to enable us to make decisions on approaches to handle the missing data.

3. STATISTICAL MODELLING

Mathematical and Statistical Models. (2020). After gaining the knowledge and insight on the functioning architecture of the council and getting assigned to the business challenge, it was important to estimate the quantitative behavior of the system. This is because from quantitively results from the mathematical model one can easily compare the observational data to identify strengths and weaknesses. There were few tests were performed on the SPSS based on the requirements:

3.1. FRIEDMAN TEST
- Statistics.laerd.com. (2020). Alternative to one-ANOVA with repeated measures.
- Group is random sample from the population.
- Sample do not need to be normally distributed.

3.2. HOLT WINTER METHOD
- Holt, C. E. (1957). Model of time series behavior
- Winters, P. R. (1960). Forecasting   Typical value (avg), Slope (trend) and Cycling repeating pattern (seasonality).

3.3. KENDALL RANK CORRELATION COEFFICIENT
- Test statistics to check the hypothesis whether two var. are regarded as statistically dependent.

3.4. PEARSON'S PRODUCT MOMENT CORRELATION
- Test significance area   Two tailed
- Measure of the strength and direction of association that exists between two variables measured on at least on interval scale.

4. SCHOOL INCIDENTS
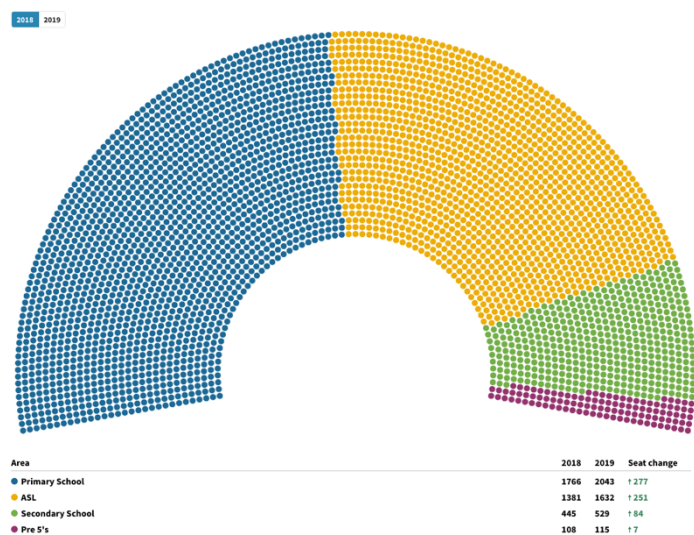
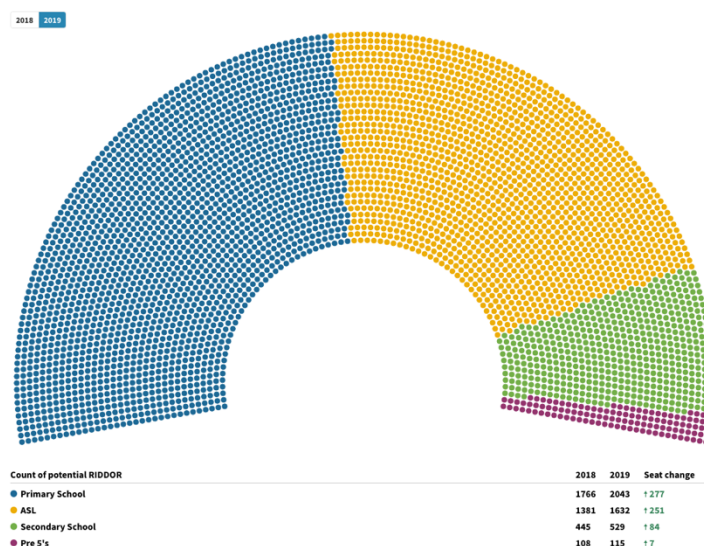### 4.1. COUNT OF POTENTIAL RIDDOR BY SERVICE/AREA OF BUSINESS

Figure 2. Potential RIDDOR for 2018   *Figure 3. Potential RIDDOR for 2019*

*Table **2**. RIDDOR by Service Area for School Violent incidents*

There are about 8063 registered cases under the Violence incidents in School out of 22,000 incidents. Among which about 6671 registered cases shows not availability in certain parameters in the excel datasheet downloaded from the HandS system which again is a huge drawback for data analysis.

(Hse.gov.uk, 2020) Among 8063 registered cases about 1334 cases are under the category, "No RIDDOR" and 58 cases are under the category, "RIDDOR/Potential RIDDOR" for the year 2018 and 2019.

In the Figure 2 & 3., the parliament graph depicts the RIDDOR cases by Service/Area of business:
1) Education Primary School
2) Education ASL (Additional Support Learning)
3) Education Secondary School
4) Education Pre 5's

From the Figure **2 &**3. and Table **2**., we can conclude the following:

- **Primary School** has the most registered RIDDOR cases for total 3809 cases among which the highest no. of cases registered for the year 2018 was 520 cases and for the year 2019 was 692 cases. Thus, one can the correlation between the two years for the months Oct- Dec.

- **Education Pre 5's** has the lowest no. of RIDDOR cases registered for about 267 cases.

- Out of 8063 cases there are 6671 cases that shows N/A in certain parameters in the dataset.

RIDDOR- *Reporting of Injuries, Diseases and Dangerous Occurrences Regulations*
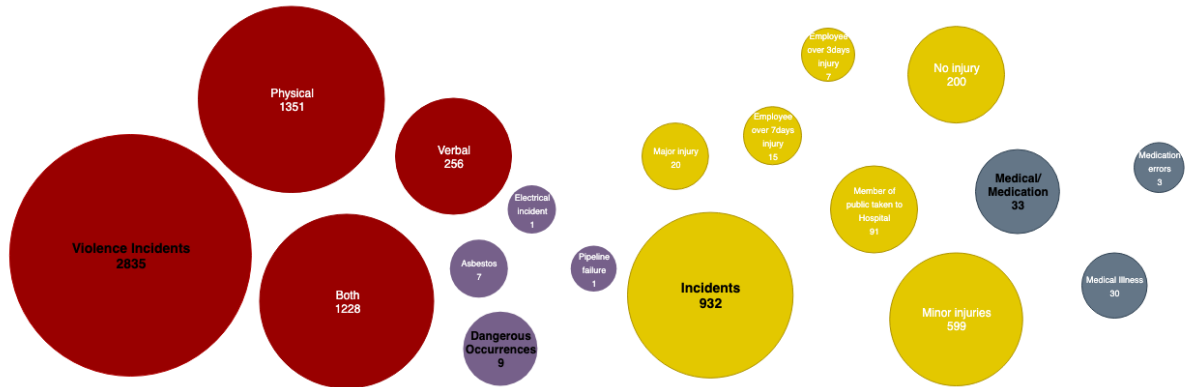
4.2. SCHOOL VIOLENT REPORTS BY CATEGORY OF INCIDENTS

In the **figure 4, the** Bubble chart, the total no. of violent incidents occurred with respect to the category of incidents has been shown. There are four major categories of incidents has been taken into consideration based on the priority the no. of times Police/Ambulance/Fire attended the premises and in general the seriousness of these incident type. The four major categories are:
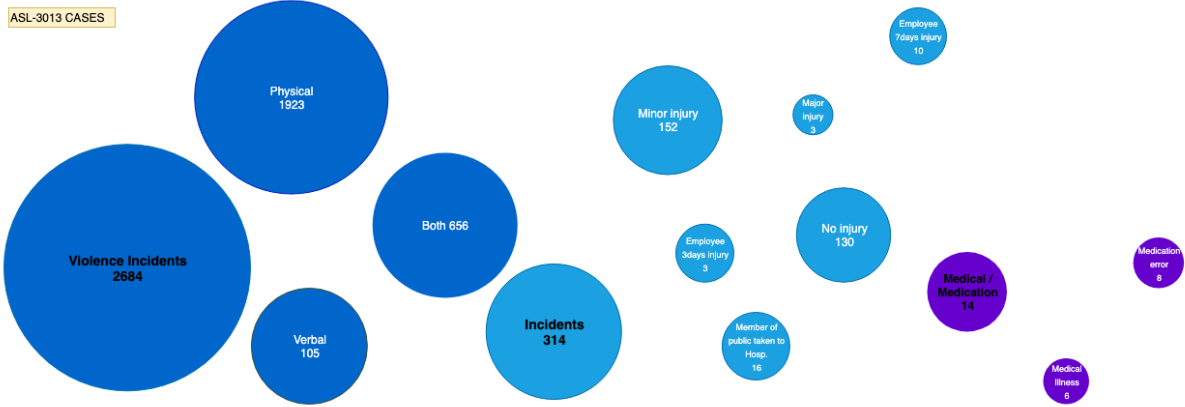
1) Violence Incidents- Violence, aggression and challenging behavior
2) Dangerous occurrences
3) Medical/Medication
4) Incident

These four categories are further divided into sub-categories that also has been shown in the Bubble chart above. The size of the bubble illustrates the maximum or minimum no. of cases reported.
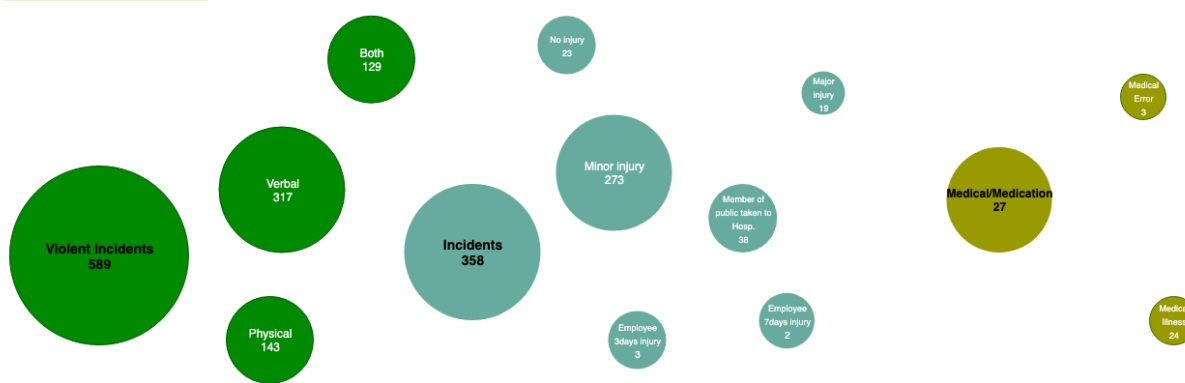
PRIMARY SCHOOL- 3809 CASES

- Physical 1351
- Verbal 256
- Violence Incidents 2835
- Both 1228
- Electrical incident 1
- Asbestos 7
- Pipeline failure 1
- Dangerous Occurrences 9
- Employee over 3days injury 7
- Employee over 7days injury 15
- No injury 200
- Major injury 20
- Member of public taken to Hospital 91
- Medical/Medication 33
- Medication errors 3
- Incidents 932
- Minor injuries 599
- Medical illness 30

ASL-3013 CASES

- Physical 1923
- Both 656
- Minor injury 152
- Major injury 3
- Employee 7days injury 10
- Violence Incidents 2684
- Verbal 105
- Incidents 314
- Employee 3days injury 3
- No injury 130
- Member of public taken to Hosp. 16
- Medical / Medication 14
- Medication error 8
- Medical Illness 6

SECONDARY SCHOOL-974 CASES

- Both 129
- No injury 23
- Verbal 317
- Minor injury 273
- Major injury 19
- Medical Error 3
- Violent Incidents 589
- Incidents 358
- Member of public taken to Hosp. 38
- Medical/Medication 27
- Physical 143
- Employee 3days injury 3
- Employee 7days injury 2
- Medical Illness 24

Pre 5's - 267 CASES

- Major injury 1
- Both 11
- Physical 79
- Employee 3days injury 1
- Employee 7days injury 1
- Violent Incidents 101
- Verbal 11
- Incidents 159
- Minor injury 118
- No injury 15
- Member of public taken to Hosp. 23
- Medical/Medication 7
- Medical illness 7

Figure 4. School violent reports by category of incidents

4.3. SCHOOL INCIDENTS BY AREA

There are 369/8063 cases that didn't mention the Area for the year 2018 and 2019. The chart**s** below **show** the majority of violent incident occurred by areas such as City Centre, North East (NE), North West (NW), West and South. The numerous charts have been used to show the possibilities how the data representation can take place unfollowing the traditional bar graph and pie charts that normally council family use.
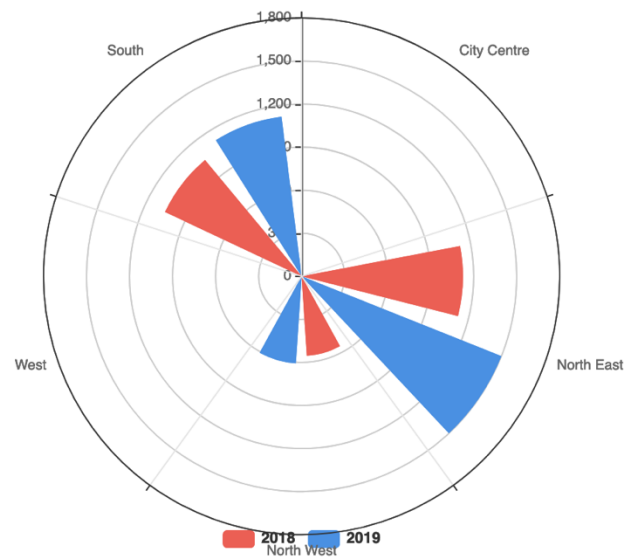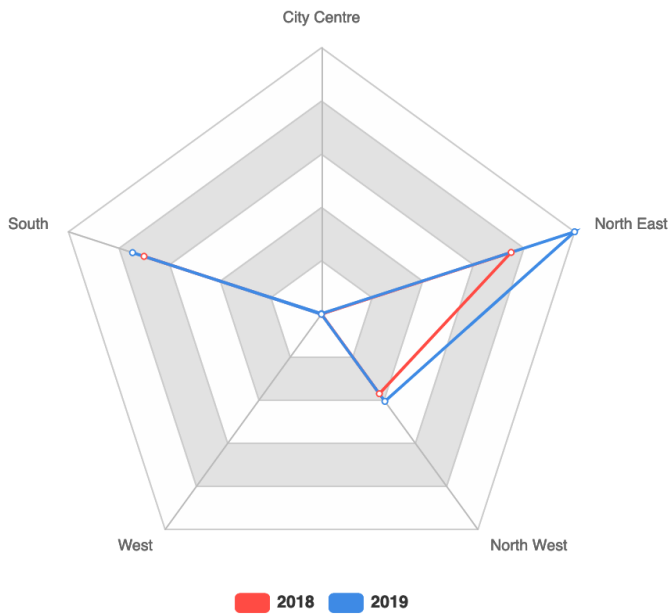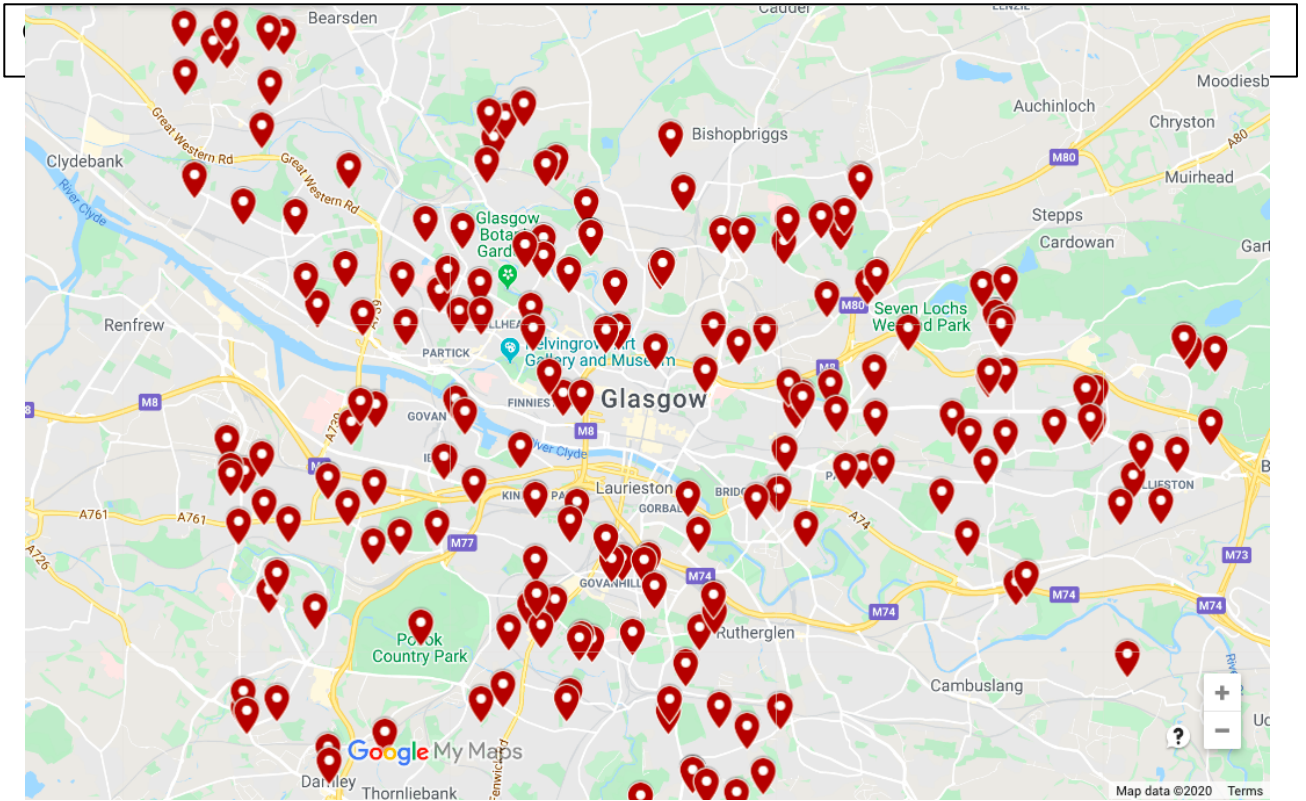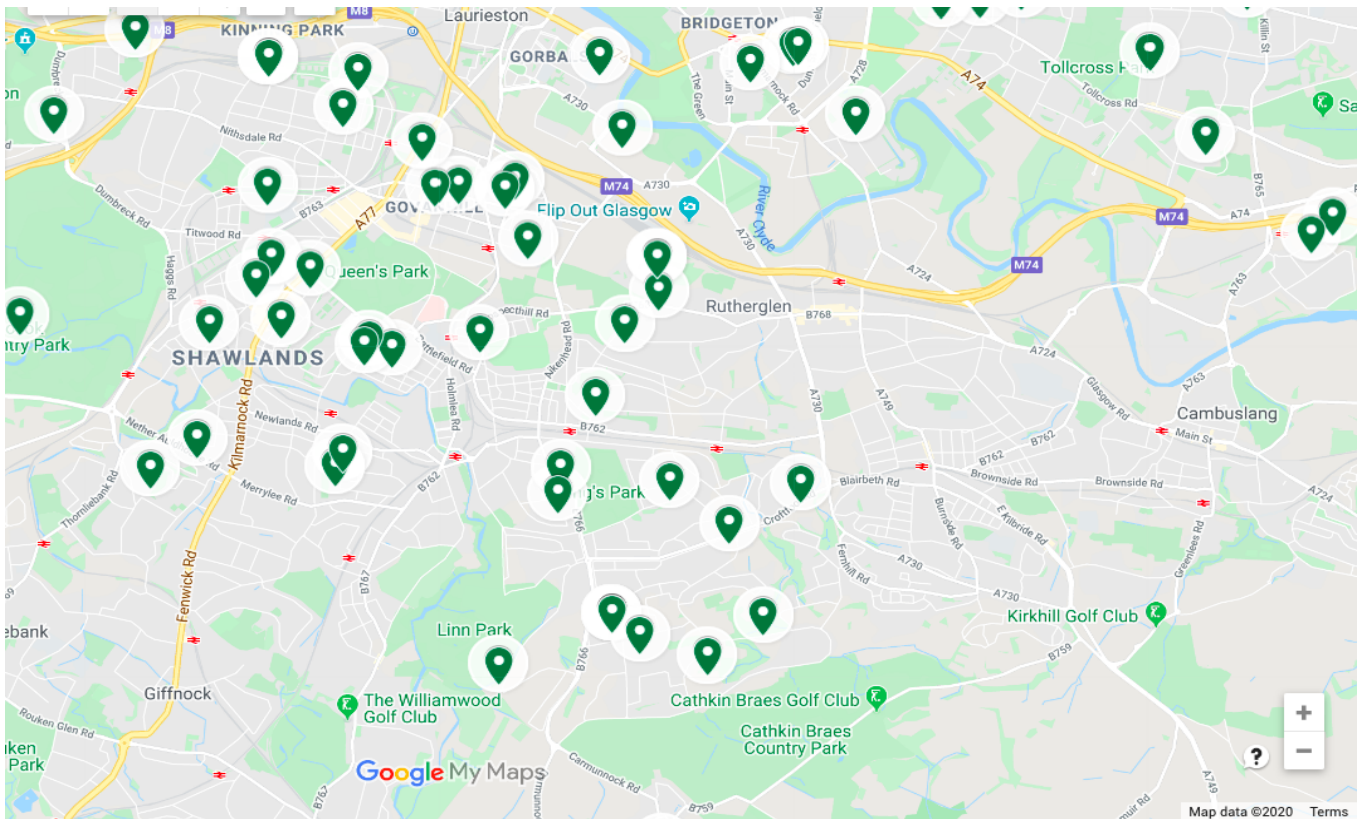

Figure 6. Radial chart for School Violent incidents

S.No.	Area	2018	2019
1	City centre	0	2
2	North East	1125	1501
3	North West	555	608
4	West	0	1
5	South	1053	1121

Table 3. Area wise School Violent incidents
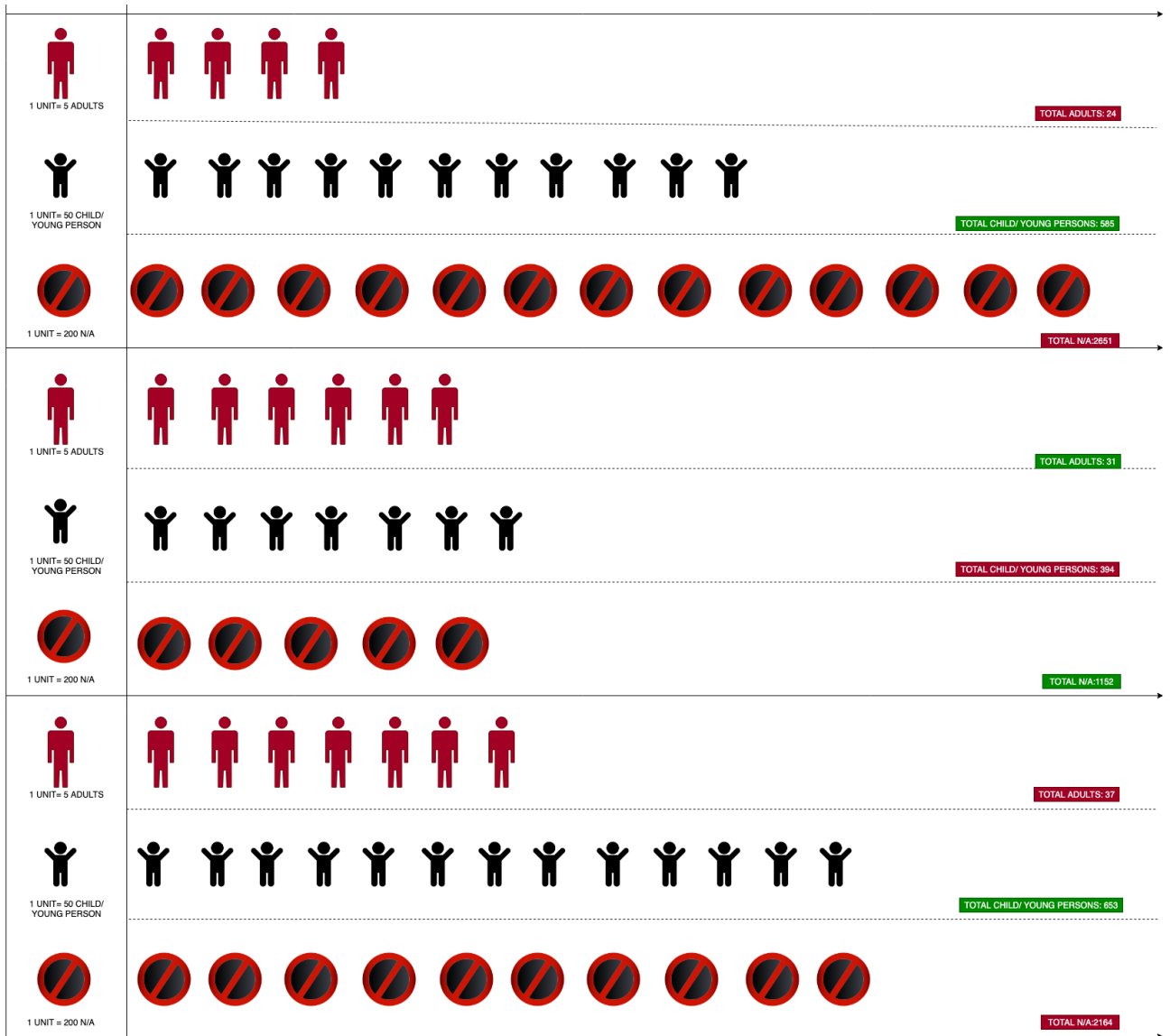
Figure 5. Pentagonal chart for School Violent incidents

NORTH EAST

Figure 7. Pictogram representation of intervention on child or young/N/a from the HANDS System
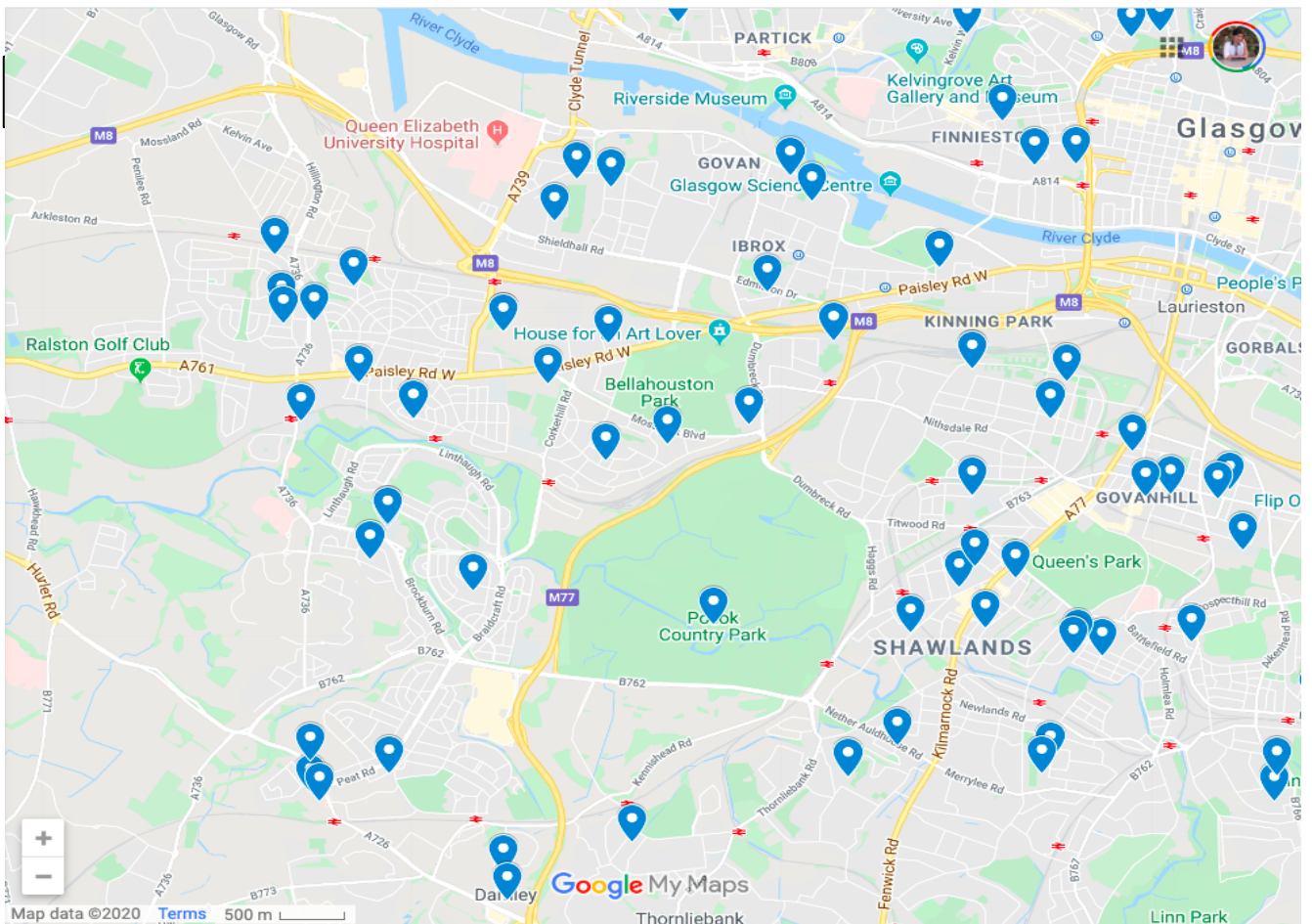
4.4. COUNT OF INCIDENTS BASED ON INTERVENTION ON CHILD OR ADULT

The pictorial representation of the school violent incidents has been illustrated through Isotype chart (pictogram). The area where the incident took place has been labelled on left side on Y-axis and total no. of cases registered on the right-hand side of the pictogram.
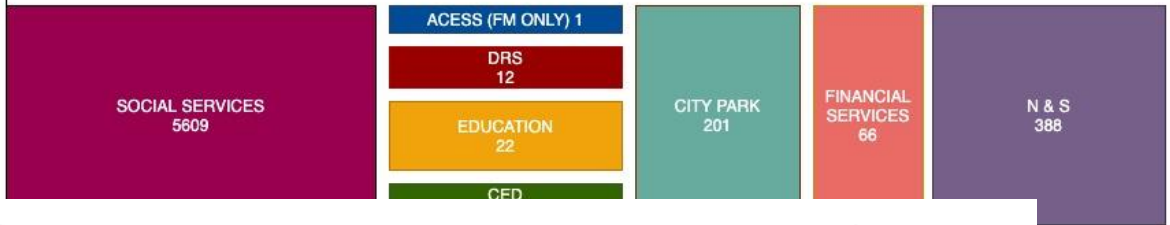
KEY FINDINGS:

- Online.visual-paradigm.com. (2020) From this pictogram we conclude that the largest child endangerment has been recorded in the South area with total no. of intervention on child 653 cases for the year 2018-2019.

- The largest no. missing values or N/A of the data has been found in the North East area with total of 2651 cases followed by 2164 cases of N/A in South Area.
- The highest no. of violent incident on Adult under RIDDOR category took place in South Area.

2019

SOCIAL SERVICES
5609

ACESS (FM ONLY) 1

DRS
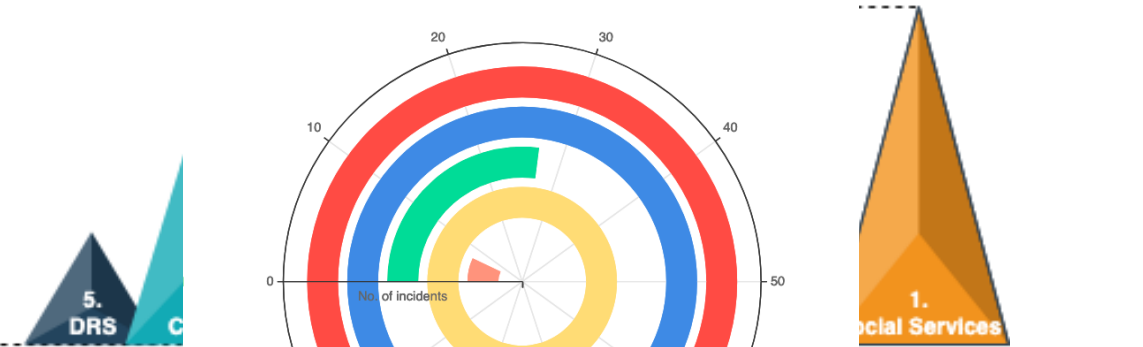12

EDUCATION
22

CED

CITY PARK
201

FINANCIAL
SERVICES
66

N & S
388

RANKING OF SERVICE AREAS BASED ON DIFFERENT PRIORITIES

TOP RANKING OF SERVICE/AREA OF BUSINESS BY RIDDOR RECORDS

TOP RANK

5.
CED

2.
Social Services

1.
N&S

3.
City Park

4.
DRS

1.
N&S

FINANCIAL
SERVICES
65

TOP RANKING OF SERVICE/AREA OF BUSINESS BY VIOLENCE, AGGRESSION & CHALLENGING BEHAVIOUR

5.
DRS

C

1.
ocial Services

20   30

10   40

0   50

No. of incidents

90   60

80   70

Potential RIDDOR for Council Incidents

TOP RANKING OF SERV

5.
DRS

2.
N&S

1.
Social Services

3.
City park

4.
Education

1.
Social Services
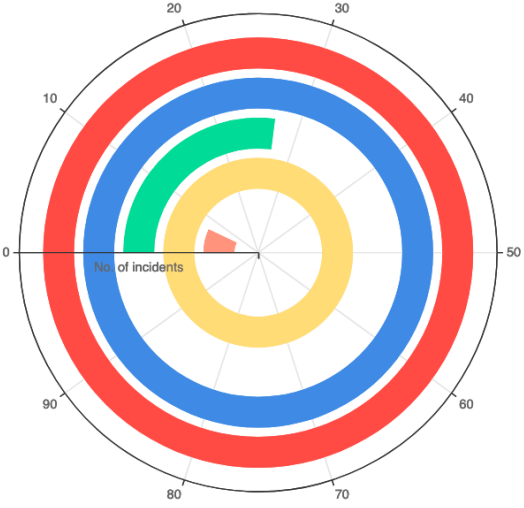
TOP RANKING OF VIOLENCE INCIDENTS IN COUNCIL AREAWISE

Figure 9. Online.visual-paradigm.com. (2020). Radial chart for Council Violent incidents

Figure 8. Council Violent incidents by department wise 2018-2019

5. CONCLUSION

5.1. Mathur, N. (2018). Improvement in Data presentation has been attained by demonstrating the different type of charts and animated visuals in front of the Head of the Health and Safety Department and the managers who all highly appreciates the infographics.

5.2. The factual errors found in the HandS database during the analysis was brought up-front and highlighted in the meetings conducted with the managers and Head of the departments which will be improved to acquire accuracy in the data analysis.

5.3. To make the HandS system more feasible, the small inputs suggested will also be taken into consideration while updating the datasets.

5.4. From the results obtained new policies and regulations will be endorsed to improve the infrastructures and drawbacks in the system to tackle the violent incidents in both School and Council.

5.5. (Hse.go.uk, 2020) A RIDDOR report has been submitted to the management team highlighting the Council and School incidents for the year 2018 and 2019.

6. LIMITATIONS

6.1. Due to the sensitive information the detailed report is avoided, and general terms have been used to give an overall insight of my work at the Glasgow City Council.

6.2. The SPSS results obtained from the applied mathematical models can't be shared in this report. However, on the request to the manager, it was granted to use the data visuals with the Strathclyde's department of Business Analysis and Consulting.

6.3. Most of the work was performed on the confidential and private government sites. Thereby, there's not as many as references in accordance with the information provided in this report.

6.4. Due to the word limit as compared to the amount of work done, this report is best presented in the most concise format as possible.

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