The 4 Case Study: Knife Crime and Reported Offences Correlations

by Amber Rigg

Kubrick Group
November 2018 Training Team
96 Great Suffolk St, London SE1 0BE
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Abstract

This study exposes correlations between Knife Crime and all reported crimes to help further our understanding of Knife Crime and contribute to developing new policies needed to tackle Knife Crime.

A snowflake schema database was designed to perform 4 studies "Study 1: Knife Crime Correlations to Reported Crime Type", "Study 2: Knife Crime Correlations to Reported Crime Category", "Study 3: Knife Crime Correlations to Reported Felony or Misdemeanour" and "Study 4: Knife Crime Correlations to Reported Average Crime Severity".

Analysis was performed on the database for the data between April 2016 to March 2017 and the punishment severity was included. The London analysis revealed a strong correlation between Knife Crime and Possession Crimes including Possession of Weapons and Drug related crimes. Additionally, a strong correlation was observed between Robberies and Knife crime. The England (excl. London) analysis revealed a strong correlation between Knife Crime and Property Crimes including Robbery, Shoplifting and Burglary crimes which independently also had strong correlations to Knife Crime. Theses correlations may reveal crime links to Knife Crimes so that these crimes may be tackled, to reduce Knife Crime and save lives.

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1 Introduction

1.1 Background

Official figures published by the Office for National Statistics show that the number of knife and offensive weapon offences rose to it's highest level since 2011, rising to 40,147 offences in the 12 months ending in March 2018, a 16 percent increase on the previous year.

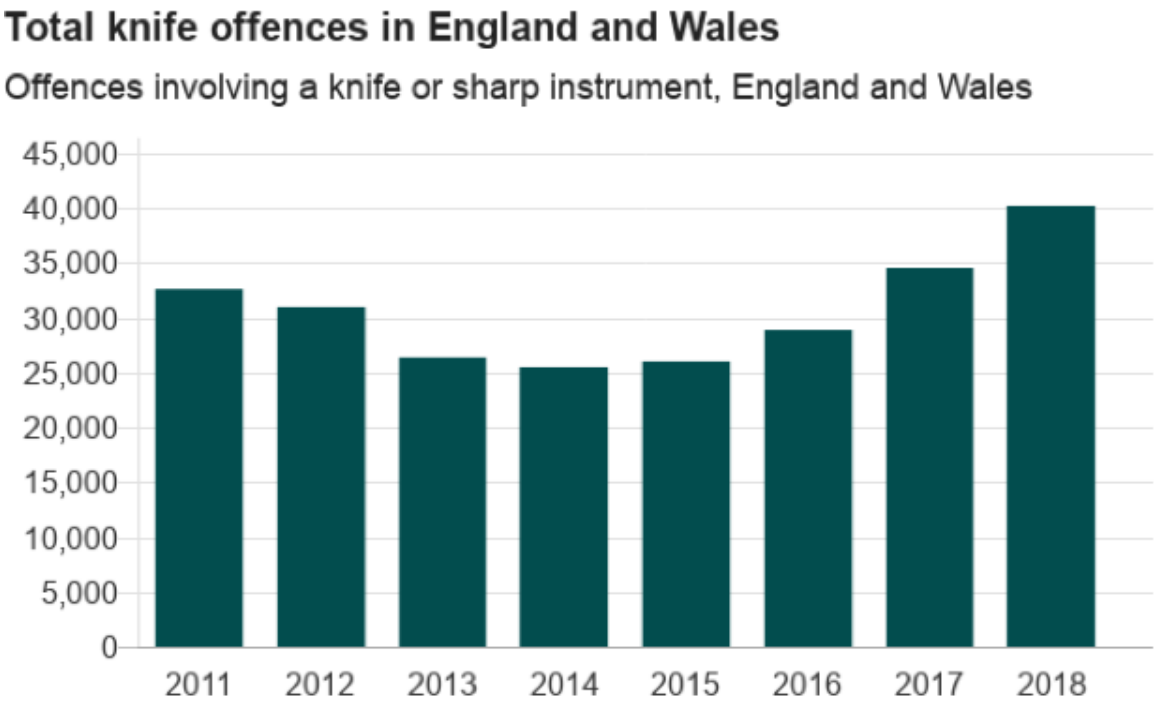


Figure 1: Total Knife Crime Offences in England and Wales per Year

Although knife crime is on the increase, it should be seen in context as most violent crimes are caused by physical attacks with no weapons, the police figures on violence also include crimes of harassment and stalking.Overall levels of violence have fallen by 25 percent since 2013 however, the more serious violent crimes are increasing

With an increase of "Knife Crime" across the United Kingdom media has exploited this issue for popularity with stories of children as young as 11 carrying blades, schools requesting knife detectors and gangs running riot in cities across the country. Additionally, politicians have also distorted the public's understanding of "Knife Crime" portraying this crime as an epidemic that must be addressed immediately. Conversely, the Metropolitan police in 2017 revealed that the overwhelming majority of people who carry knives are not gang members but are just scared and carry them for protection.

Across the UK we observe initiative after initiative to tackle knife crime including amnesties, charities in the name of the fallen, appeals from the police and mayoral statements. However, these seem to have little or no effect; unlike guns in the US knives are everyday objects so there are limits to what "Knife Control" can achieve by itself.

The reality of knife crime is much more complex and must be fully examined to

effectively tackle. As a nation we are aware of 'Knife Crime' but lack the knowledge or ability to effectively address it. Without official data analysis and well informed discussion our understanding of the knife crime problem is distorted by personal assumptions, media representation and political projection.

An unbiased analysis of knife crime data in relation to all reported crimes is key to understanding potential causes and correlations with other crimes because, "knife control" is limited and new approaches must be taken to reduce knife crime. It may be more effective to target crimes that are related to knife crime to indirectly reduce knife crime and ultimately save lives.

1.2 Aim

The study aims to provide an unbiased analysis of knife crime data in relation to all reported offences across England by Police Force Area(excl. London) and London by Local Authority District. The study will consider data between April 2016 to March 2018 and will also consider the severity of punishment.

The in depth study on London crime is important as London currently has the highest rate of knife crime.

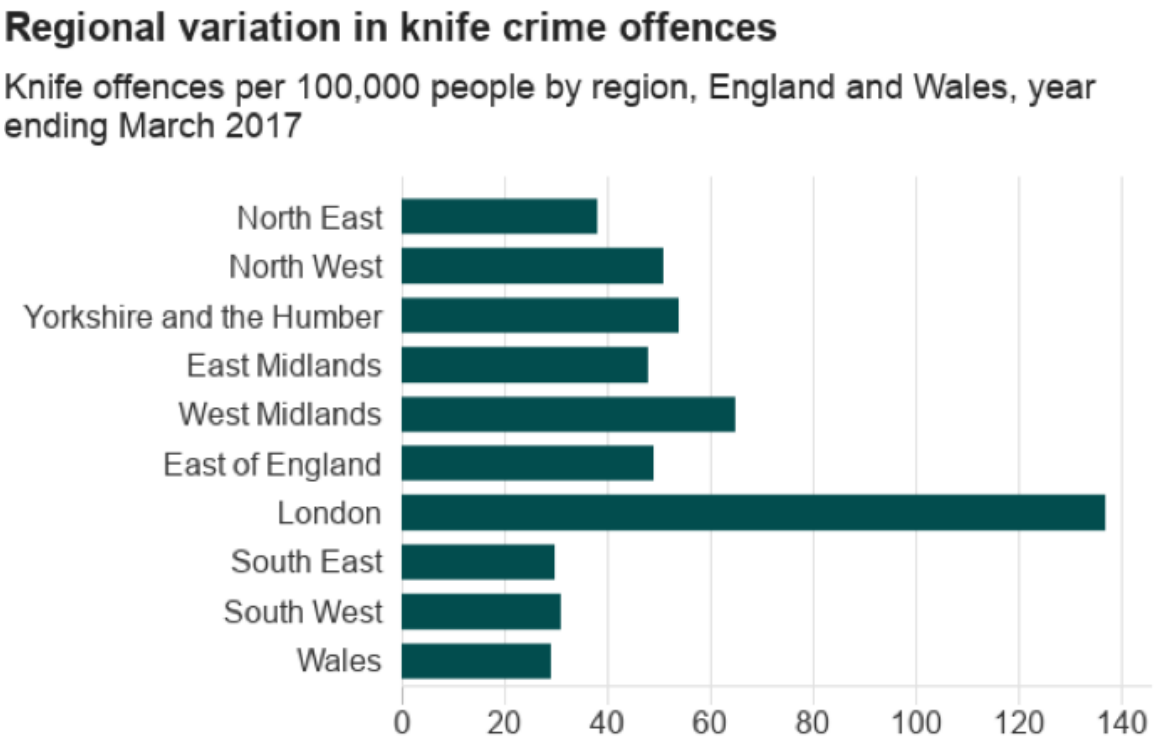


Figure 2: Regional Knife Crime Offences 2016/2017

This study consists of 4 separate studies including "Study 1: Knife Crime Correlations to Reported Crime Type", "Study 2: Knife Crime Correlations to Reported Crime Category", "Study 3: Knife Crime Correlations to Reported Felony or Misdemeanor" and "Study 4: Knife Crime Correlations to Reported Average Crime Severity".These studies should expose any correlations between knife crime and all reported crimes to help further our understanding of knife crime and contribute to developing new policies and actions needed to tackle knife crime to save lives.

2 Model Engineering

2.1 Sourcing Data

When performing data analysis, it is key to source data which is factual and reliable to build a truthful, effective database to perform innovative analysis. All data sources within this study are valid, authorized and reliable.

The Reported Offences Data across England, Wales, Northern Ireland per month was provided by the Home Office on the website data.police.uk.

All other data utilized was provided by the Office for National Statistics which is the executive office of the UK Statistics Authority, a non-ministerial department which reports directly to the UK Parliament. They are responsible for collecting and publishing statistics related to the economy, population and society at national, regional and local levels as well as, conducting the census in England and Wales every 10 years.

All links to data sources are provided under the Data Source section.

2.2 Importing Data

Importing data into SQL can be done through different methods including SSIS Packages, Alteryx and SQL directly. For all Reported Offences data (downloaded as individual excel files per year and police force area) Alteryx was harnessed to download all data into one table in SQL. All other data was imported directly via SQL as each file corresponded to a new table.

Notably, when importing data as tables this will be directly into a Database and Schema that already exist. For this study a database named Crime was created and all imported raw data was stored as tables in the dbo schema which is the default schema for a newly created database.

2.2.1 Importing Reported Offences Data using Alteryx

Alteryx was harnessed to import multiple excel files into one table in SQL, this also possible to do by SSIS Packages. Alteryx was used primarily as the data imported was large and would have taken a considerable amount of time to import using other packages.

Importing Data using Alteryx involved 3 easy steps.

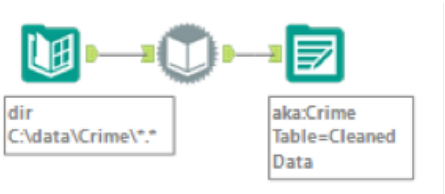


Figure 3: Alteryx Large Data Import

1. The first step involves using the Input Data Tool.In the Directory requirement it was important to select the correct file including only all the data that was to be imported. Notably, it was important to tick "Include SubDirectories" to include all data in every file.

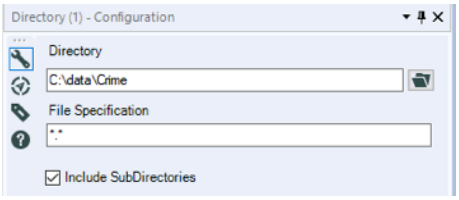


Figure 4: Alteryx Large Data Import Step 1

2. The second step harnessed the Dynamic Input Tool.The configuration tab allows for all the data within the selected file to be imported. Here the "Read a List of Data Sources" option was chosen with the "Field: Full Path" and "Action: Change Entire File Path". The Input Data Source Template Selected was a randomly selected excel file from the data source as all files had the same formatting.

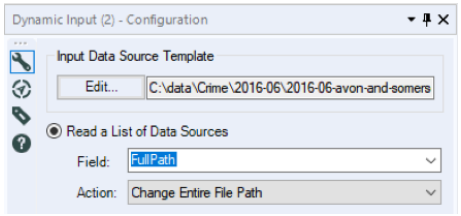


Figure 5: Alteryx Large Data Import Step 2

3. The third step involves using the Output Data Tool. The final step involved setting up a connection to the database in SQL for the data import. Here it can clearly be seen that the data being imported to the "Crime" database as a table named "Cleaned Data".

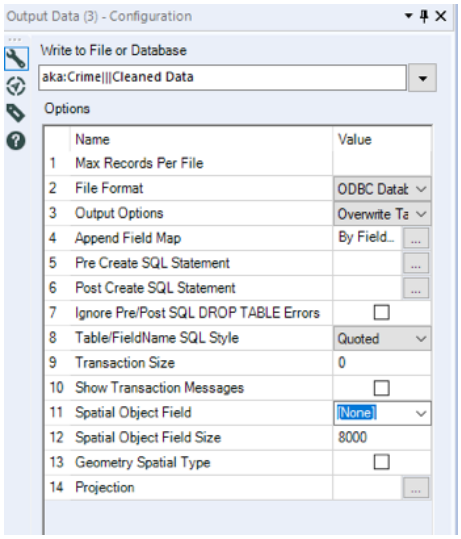


Figure 6: Alteryx Large Data Import Step 3

2.2.2 Importing Other Data using SQL

Importing data directly from Excel files by the SQL Server Import and Export Wizard was utilized to import the Knife Crime Data by Police Force, Knife Crime Data by LAD (London), Population Data and LAD to Police Force Data in a single step directly from the Excel files.

This easy step by step method allows for selection of data source type, excel file, destination, excel sheets within the excel file and whether to Specify Table Copy or Query.

2.3 Cleansing Data

Data Cleansing is the process of detecting, correcting and removing inaccurate or unnecessary data. It is important to maintain excellent quality data so that accurate and decisive analysis can be effectively performed.

In this study the clean data tables where created by manipulating the raw data tables then harnessing the SELECT INTO function to create new tables in a schema which was name 'Staged'.

Data Cleansing for SQL can also be done effectively in Alteryx as well as by code in SQL. For this study all data was cleansed using code in SQL however, cleansing of the Crime Offences Data was also performed using Alteryx for comparison.

All code used in cleansing can be viewed in the Appendix A.

2.3.1 Reported Crime Offences Data

Alteryx Cleansing

Data Cleansing is possible with Alteryx through an intuitive process of dragging and connecting tools to refine the data imported before it is exported to SQL. Such tools allow for the use of filters, the addition of primary keys, the replacement of nulls, modifying cases and much more. A simplistic view of this process can be observed below applied to the Reported Crime Offences Data.

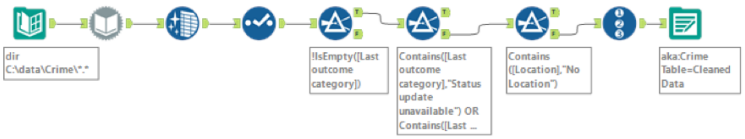


Figure 7: Alteryx Large Data Cleaning

SQL Code Cleansing

Removing Unnecessary Field

Not all imported fields where necessary for analysis therefore, in the creation of the new table the fields [Reported by], [Location] and [Context] where not selected.

Removing Nulls

Profiling the data revealed numerous crimes with no [Crime ID] resulting in null data. To remove the null data filtering was performed using the WHERE clause when "[Crime ID] is not null".

Removing Data with no LSOA Code

The study focuses on the geographical points of crimes committed therefore, any data with no [LSOA Code], [Longitude] or [Latitude] was unusable. To remove this unwanted data filtering was performed using the WHERE clause when "[Location] != 'No Location'".

Removing Unnecessary Geographical Data

This study focuses only on crime offences and knife crime within England therefore, it was important to remove all data not from England. Notably the first character of the LSOA Code signaled the country of the crime i.e. N represents Northern Ireland. By harnessing the WHERE clause and a SUBSTRING command it was possible to remove all data where the LSOA code started with a character which did not represent England. The WHERE clause was applied to the code "SUBSTRING([LSOA Code],1,1) not in ('K','N','W')" which removed any LSOA codes where the first character was either K (United Kingdom), N (Northern Ireland) or W (Wales).

Removing Uncommitted Crimes

The Reported Offences data included false reports where no one was charged or guilty. As this study focuses on only crimes committed it was important to remove any reported crimes which were not committed notably, any crimes where the outcome had not been decided were also removed. To remove this unwanted data filtering was performed using the WHERE clause when "[Last outcome category] not in ('Under investigation','Further investigation is not in the public interest','Court case unable to proceed','Status update unavailable','Investigation complete; no suspect identified','Court result unavailable','Unable to prosecute suspect',Defendant found not guilty','Awaiting court outcome')".

Naming, Casting and Tidying Data

Once the data set was correctly filtered to remove any redundant data, it was then simple to tidy the data by harnessing LTRIM() and the CAST() function to convert the value into a specified datatype which, would later be necessary for performing analysis. Notably, CONCAT() was used to add the first day of the month onto every month value so that it could be correctly casted as a date. Finally each field was assigned a suitable field name.

Removing Duplicates

The DISTINCT tool was harnessed to remove any duplicated data within the table; to do so correctly it was important to include the original [Crime ID] field.

Data Cleansing Code (incl. [Crime ID])

The Data Cleansing Code (incl. [Crime ID]) was then created into a new table named the [Crime Data with Original Crime ID] in the [Staged] schema.

```
SELECT DISTINCT
       [Crime ID]
       ,CAST(CONCAT ([Month],-01) as DATE) [Date]
       ,LTRIM([Falls within]) [Police Force]
       ,LTRIM(TRY_CAST([Longitude] as FLOAT)) [Longitude]
       ,LTRIM(TRY_CAST([Latitude] as FLOAT)) [Latitude]
       ,LTRIM(CAST([LSOA code] as VARCHAR(9))) [LSOA Code]
       ,LTRIM(CAST([LSOA name] as VARCHAR(50))) [LSOA name]
       ,LTRIM([Crime type]) [Crime]
       ,LTRIM([Last outcome category]) [Outcome]
into [Staged].[Crime Data with Original Crime ID]
FROM [dbo].[Full Crime Data]
WHERE [Crime ID] is not null
and [Last outcome category] not in ('Under␣investigation','Further␣
   investigation␣is␣not␣in␣the␣public␣interest','Court␣case␣unable␣to␣
   proceed','Status␣update␣unavailable','Investigation␣complete;␣no␣
   suspect␣identified','Court␣result␣unavailable','Unable␣to␣prosecute␣
   suspect',Defendantt found not guilty','Awaiting court outcome')
and␣[Location]␣!=␣'No Location'
and␣SUBSTRING([LSOA␣Code],1,1)␣not␣in␣('K','N','W')
```

Listing 1: Reported Crime Offences Cleaning incl. Crime ID

Data Cleansing Code

It was then possible to create a new table in the [Staged] schema without the original crime ID by not selecting it in the SELECT INTO command.

The new table named [Crime Data] was then altered to add an easy use identity field labelled [Crime ID] to act as the primary key using the code as shown below.

```
ALTER TABLE Staged.[Crime Data]
ADD [Crime ID] int identity primary key
```

Listing 2: Reported Crime Offences Cleaning Addition of Primary Key Column

2.3.2 Knife Crime Data by Police Force

Removing Unnecessary Field

Not all imported fields where necessary for analysis therefore in the creation of the new table the fields [2008/09], [F3], [2009/10], [F5], [2010/11], [F7], [2011/12], [F9], [2012/13] and [F11] where not selected.

Removing Nulls

Profiling the data revealed numerous knife crimes where no Police Region had been given. To remove the null data filtering was performed using the WHERE clause when "[F1] is not null".

Nulls were also observed in the Knife Crime(per 100,000 population) for each year these were removed using ISNULL() and replaced with an empty space.

Removing Unnecessary Geographical Data

This study focuses only on crime offences and knife crime within England and for this particular table for each Police Force Area therefore, it was important to remove all data not for English Police Forces. To remove the redundant data filtering was performed using the WHERE clause when "[F1] not in('British Transport Police','ENGLAND AND WALES4,5,6,7,8','Dyfed-Powys','Gwent','North Wales','South Wales','WALES','North East Region','North West Region','Yorkshire and the Humber Region','East Midlands Region','West Midlands Region','East of England Region','London','South East Region','South West Region')".

Naming, Casting and Tidying Data

Once the data set was correctly filtered to remove any redundant data it was then simple to tidy the data by harnessing the CAST() function to convert the values into a specified datatype which, would later be necessary for performing analysis. Notably for consistency all numeric data was casted as integers.

Finally, each field was assigned a suitable field name as the raw data table included field names such as [F1],[F15],etc.

Data Cleansing Code

The Data Cleansing Code was then created into a new table named the [Knife Crime Country]in the [Staged] schema.

```
SELECT CAST([F1] as VARCHAR(50)) [Police Region]
     ,CAST([2013/14] as INT) [2013/2014 Knife Crime]
     ,CAST(ISNULL([F13],'␣') as INT)[2013/2014 Knife Crime(per 100,000
        population)]
     ,CAST([2014/15] as INT)[2014/2015 Knife Crime]
     ,CAST(ISNULL([F15],'␣') as INT)[2014/2015 Knife Crime(per 100,000
        population)]
     ,CAST([2015/16] as INT)[2015/2016 Knife Crime]
     ,CAST(ISNULL([F17],'␣') as INT)[2015/2016 Knife Crime(per 100,000
        population)]
     ,CAST([2016/17] as INT)[2016/2017 Knife Crime]
     ,CAST(ISNULL([F19],'␣') as INT)[2016/2017 Knife Crime(per 100,000
        population)]
     ,CAST([2017/18] as INT)[2017/2018 Knife Crime]
```

```
     ,CAST(ISNULL([F21],'␣') as INT)[2017/2018 Knife Crime(per 100,000
        population)]
into Staged.[Knife Crime Country]
FROM [dbo].[Knife Crime Country]
WHERE [F1] not in(
  'British␣Transport␣Police','ENGLAND␣AND␣WALES4,5,6,7,8','Dyfed-Powys','
     Gwent','North␣Wales','South␣Wales','WALES','North␣East␣Region','
     North␣West␣Region','Yorkshire␣and␣the␣Humber␣Region','East␣Midlands␣
     Region','West␣Midlands␣Region','East␣of␣England␣Region','London','
     South␣East␣Region','South␣West␣Region')
  and [F1] is not null
```

Listing 3: Knife Crime Data by Police Force Data Cleaning

2.3.3 Knife Crime Data by LAD (London)

Removing Unnecessary Field

Not all imported fields where necessary for analysis therefore in the creation of the new table the fields [F2], [F5], [F8] and [Change in total 2016/17 - 2017/18] where not selected.

Removing Nulls

Profiling the data revealed that preventing null values in any field (excluding [F1]) would remove all nulls from the final table. Therefore, to remove the null data filtering was performed using the WHERE clause when "[2016/17] is not null".

Removing Unnecessary Rows

The table also included a row for the 'Grand Total' which was unnecessary for the analysis. To remove the 'Grand Total' row filtering was performed using the WHERE clause when "[F1] != 'Grand Total'".

Naming, Casting and Tidying Data

Once the data set was correctly filtered to remove any redundant data it was then simple to tidy the data by harnessing the CAST() function to convert the values into a specified datatype which, would later be necessary for performing analysis. Notably, for consistency all numeric data was casted as integers.

Finally, each field was assigned a suitable field name as the raw data table included field names such as [F1], [F7],etc.

Data Cleansing Code

The Data Cleansing Code was then created into a new table named the [Knife Crime London]in the [Staged] schema.

```
SELECT
       CAST([F1] as VARCHAR(50)) [London Borough]
      ,CAST([2016/17] as INT) [2016/2017 Knife Crime]
      ,CAST([F4] as INT)[2016/2017 Knife Crime with Injury]
      ,CAST([2017/18] as INT)[2017/2018 Knife Crime]
      ,CAST([F7] as INT)[2017/2018 Knife Crime with Injury]
into Staged.[Knife Crime London]
FROM [dbo].[Knife Crime London]
WHERE [2016/17] is not null
```

Listing 4: Knife Crime Data by LAD (London) Data Cleaning

2.3.4 Population Data

Removing Unnecessary Field

Not all imported fields where necessary for analysis therefore in the creation of the new table the fields [F2] and [F4] where not selected.

Removing Nulls

Nulls were also observed in the [F3] field which related to data of the wrong granularity, these were removed using the WHERE clause when "[F3] is not null".

Naming, Casting and Tidying Data

Once the data set was correctly filtered to remove any redundant data it was then simple to tidy the data by harnessing the CAST() function to convert the values into a specified datatype which would later be necessary for performing analysis. Notably for consistency all numeric data was casted as intergers.

Finally, each field was assigned a suitable field name as the raw data table included field names such as [F1], [F3],etc.

Data Cleansing Code

The Data Cleansing Code was then created into a new table named the [LSOA Population]in the [Staged] schema.

```
SELECT
       CAST([F1] as VARCHAR(9)) [LSOA Code]
      ,CAST([F3] as VARCHAR(50)) [LSOA Name]
      ,CAST([F5] as INT) [Population 2017]
```

```
     ,CAST([F6] as INT) [Population 2016]
     ,CAST([F7] as INT) [Population 2015]
     ,CAST([F8] as INT) [Population 2014]
into Staged.[LSOA Population]
FROM [dbo].[LSOA Population]
WHERE [F3] is not null
```

Listing 5: Population Data Cleaning

2.3.5 LAD to Police Force Data

Removing Unnecessary Field

Not all imported fields where necessary for analysis therefore in the creation of the new table the fields [12 months to], [ONScode], [Offence] and [Rolling year total number of offences] where not selected.

Naming, Casting and Tidying Data

Once the data set was correctly filtered to remove any redundant data it was then simple to tidy the data by harnessing the CAST() function to convert the values into a specified datatype which, would later be necessary for performing analysis.

Finally, each field was assigned a suitable field name.

Data Cleansing Code

The Data Cleansing Code was then created into a new table named the [LAD Conversion]in the [Staged] schema.

```
SELECT
     CAST([Local Authority] as VARCHAR(50)) [Local Authority District]
     ,CAST([Region] as VARCHAR(50)) [Region]
     ,CAST([Police force area] as VARCHAR(50)) [Police Force Area]
into Staged.[LAD Conversion]
FROM [dbo].[LAD to Force]
```

Listing 6: LAD to Police Force Data Cleaning

2.4 Model Building

The imported and cleansed Reported Crime Offence Data was then built into a multidimensional schema designed for Online Analytical Processes (OLAP). With the Reported Crime Offence Data acting as the FACT Table enriching allows for the creation of DIMENSION tables and subsequently the creation of LOOKUP Tables. The DIMENSION tables describe dimensions of data within the FACT Table and the LOOKUP Tables provide definitions for ambiguous data. The resulting model data warehouse system for the Reported Crime Offence Data would be a snowflake schema as shown below.

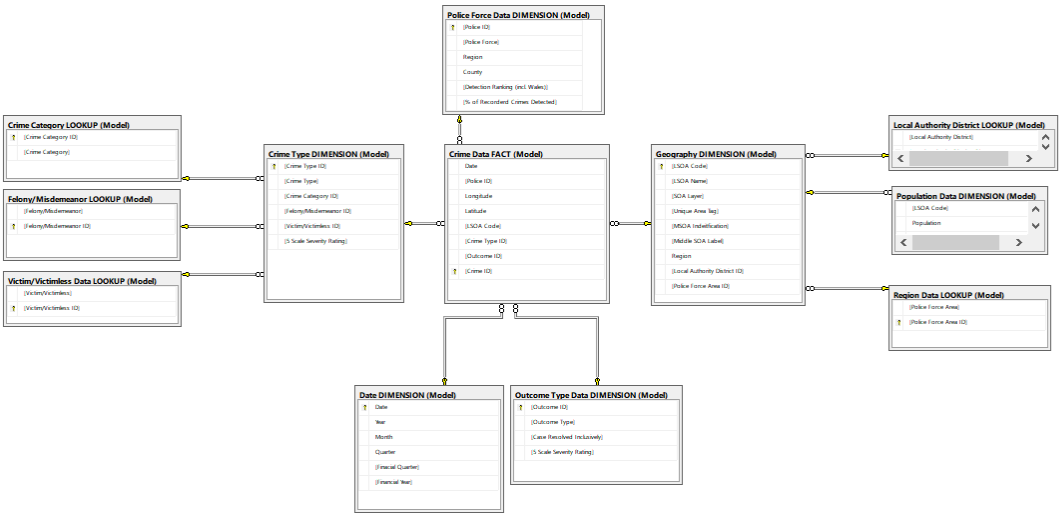


Figure 8: Reported Crime Offence Data Snowflake Schema

Accordingly, the Knife Crime Data by LAD (London) FACT table and the Knife Crime Data by Police Force FACT table will be successfully linked to the Crime Data FACT Table for easy analysis by appropriate LOOKUP Tables as shown below.

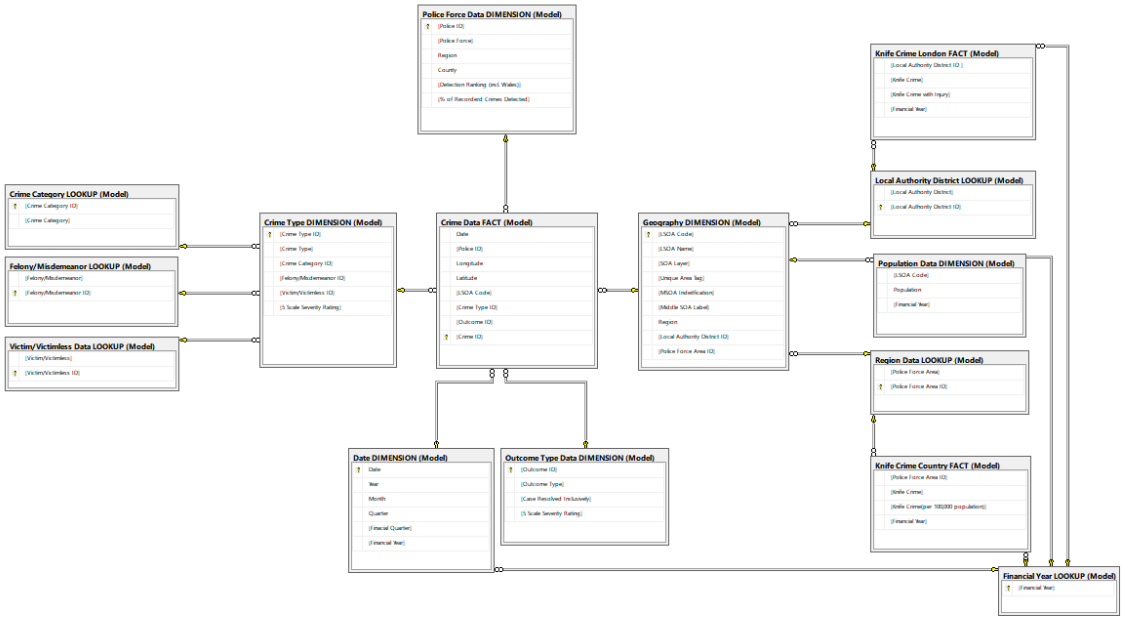


Figure 9: Database Model

The corresponding code for this section can view in the appendices B, C, D and E.

2.4.1 Enriching Data

Data enrichment is key to adding value to and improving the quality of the data enabling the data to be a more valuable asset. Enriching data allows an analyst to get more out of data, to do more with data, to access data more easily and to be more proactive in its use.

For this study data enrichment of the Reported Crime Offences Data was provided by external data sources previously imported as well as self assessments made on the data. The data enrichment tables were observed as DIMENSION Tables and LOOKUP Tables were also included to provide further insight into ambiguous data without using a Data Dictionary.

All newly created tables which subsequently will partake in building of the model were created in a schema named [Model].

2.4.2 Reported Crime Offences Data Enrichment and Model Building

Crime Data FACT Table

The Crime Data was successfully imported and cleansed however, was not in a suitable format to work effectively as a FACT table. The format of the original cleaned Crime Data Table in the [Staged] schema can be observed below.

100 %

Results | Messages

	Date	Police Force	Longitude	Latitude	LSOA Code	LSOA name	Crime	Outcome	Crime ID
1	2017-05-01	Norfolk Constabulary	0.883481	52.6268	E01026451	Breckland 008C	Drugs	Offender given conditional discharge	1
2	2015-11-01	Metropolitan Police Service	-0.002028	51.5419	E01033583	Newham 013G	Violence and sexual offences	Offender given a caution	2
3	2017-03-01	Northumbria Police	-1.53893	54.9897	E01008575	North Tyneside 030E	Burglary	Offender sent to prison	3
4	2017-10-01	Norfolk Constabulary	1.20842	52.9413	E01026770	North Norfolk 001A	Drugs	Offender given a caution	4
5	2015-12-01	West Yorkshire Police	-1.50066	53.682	E01011916	Wakefield 017D	Violence and sexual offences	Formal action is not in the public interest	5
6	2017-10-01	West Midlands Police	-1.99585	52.5199	E01010106	Sandwell 019D	Robbery	Offender sent to prison	6
7	2018-01-01	Essex Police	0.699378	51.5426	E01015896	Southend-on-Sea 010B	Violence and sexual offences	Formal action is not in the public interest	7
8	2016-01-01	Metropolitan Police Service	-0.069531	51.5164	E01004309	Tower Hamlets 015D	Criminal damage and arson	Offender given a caution	8
9	2016-03-01	Cheshire Constabulary	-2.89559	53.2895	E01018564	Cheshire West and Chester 007E	Vehicle crime	Suspect charged as part of another case	9
10	2016-03-01	Thames Valley Police	-0.966803	51.4451	E01016375	Reading 014B	Drugs	Offender given a caution	10
11	2016-07-01	Devon & Cornwall Police	-3.41246	50.6256	E01019919	East Devon 019D	Violence and sexual offences	Offender given a caution	11
12	2017-11-01	North Yorkshire Police	-1.10943	53.9877	E01013429	York 006B	Violence and sexual offences	Offender given conditional discharge	12
13	2016-05-01	Dorset Police	-1.86783	50.8054	E01020393	East Dorset 008D	Violence and sexual offences	Action to be taken by another organisation	13
14	2016-03-01	West Midlands Police	-1.83967	52.5242	E01009007	Birmingham 023D	Shoplifting	Local resolution	14
15	2016-03-01	Lancashire Constabulary	-2.66098	53.7378	E01025402	South Ribble 008D	Criminal damage and arson	Local resolution	15
16	2016-09-01	Northumbria Police	-1.6917	55.4009	E01027358	Northumberland 005A	Shoplifting	Offender ordered to pay compensation	16
17	2017-02-01	Essex Police	1.24957	51.8463	E01022012	Tendring 008H	Violence and sexual offences	Offender given a caution	17
18	2017-08-01	Essex Police	0.905583	51.8798	E01021684	Colchester 011B	Shoplifting	Offender given suspended prison sentence	18
19	2017-09-01	Kent Police	0.477492	51.304	E01024719	Tonbridge and Malling 001A	Criminal damage and arson	Action to be taken by another organisation	19

Figure 10: Crime Data FACT Table Before Modelling

Harnessing the select into statement it was possible to create a Crime Data FACT Table from the Crime Data Table in the [Staged] schema.

Firstly, it was important to not select the [LSOA Name] as this is not required in the FACT Table and would be more suitable to be observed in a DIMENSION Table. Secondly, following good database practices the fields [Police Force], [Crime] and [Outcome] were converted to the fields [Police ID], [Crime Type ID] and [Outcome ID] and stored as integers. DIMENSION Tables would then provide further information on each individual ID. The CASE statement was utilized to create the individual ID fields from their original fields. An example of the CASE statement used to create the [Crime Type ID] field is below.

```
CAST(CASE [Crime]
       WHEN 'Anti-social␣behaviour' then 1
       WHEN 'Burglary' then 2
       WHEN 'Vehicle␣crime' then 3
       WHEN 'Violence␣and␣sexual␣offences' then 4
       WHEN 'Criminal␣damage␣and␣arson' then 5
       WHEN 'Other␣theft' then 6
       WHEN 'Public␣order' then 7
       WHEN 'Bicycle␣theft' then 8
       WHEN 'Drugs'then 9
       WHEN 'Theft␣from␣the␣person' then 10
       WHEN 'Other␣crime' then 11
       WHEN 'Shoplifting' then 12
       WHEN 'Robbery' then 13
       WHEN 'Possession␣of␣weapons' then 14
END as INT) [Crime Type ID]
```

Listing 7: Crime Data FACT Table CASE Example

The Table was subsequently created in the [Model] Schema and can be observed below.

100 %

Results | Messages

	Date	Police ID	Longitude	Latitude	LSOA Code	Crime Type ID	Outcome ID	Crime ID
1	2017-05-01	24	0.883481	52.6268	E01026451	9	2	1
2	2015-11-01	23	-0.002028	51.5419	E01033583	4	4	2
3	2017-03-01	27	-1.53893	54.9897	E01008575	2	8	3
4	2017-10-01	24	1.20842	52.9413	E01026770	9	4	4
5	2015-12-01	38	-1.50066	53.682	E01011916	4	5	5
6	2017-10-01	37	-1.99585	52.5199	E01010106	13	8	6
7	2018-01-01	12	0.699378	51.5426	E01015896	4	5	7
8	2016-01-01	23	-0.069531	51.5164	E01004309	5	4	8
9	2016-03-01	4	-2.89559	53.2895	E01018564	3	6	9
10	2016-03-01	34	-0.966803	51.4451	E01016375	9	4	10
11	2016-07-01	9	-3.41246	50.6256	E01019919	4	4	11
12	2017-11-01	25	-1.10943	53.9877	E01013429	4	2	12
13	2016-05-01	10	-1.86783	50.8054	E01020393	4	10	13
14	2016-03-01	37	-1.83967	52.5242	E01009007	12	7	14
15	2016-03-01	19	-2.66098	53.7378	E01025402	5	7	15
16	2016-09-01	27	-1.6917	55.4009	E01027358	12	14	16
17	2017-02-01	12	1.24957	51.8463	E01022012	4	4	17
18	2017-08-01	12	0.905583	51.8798	E01021684	12	3	18
19	2017-09-01	18	0.477492	51.304	E01024719	5	10	19

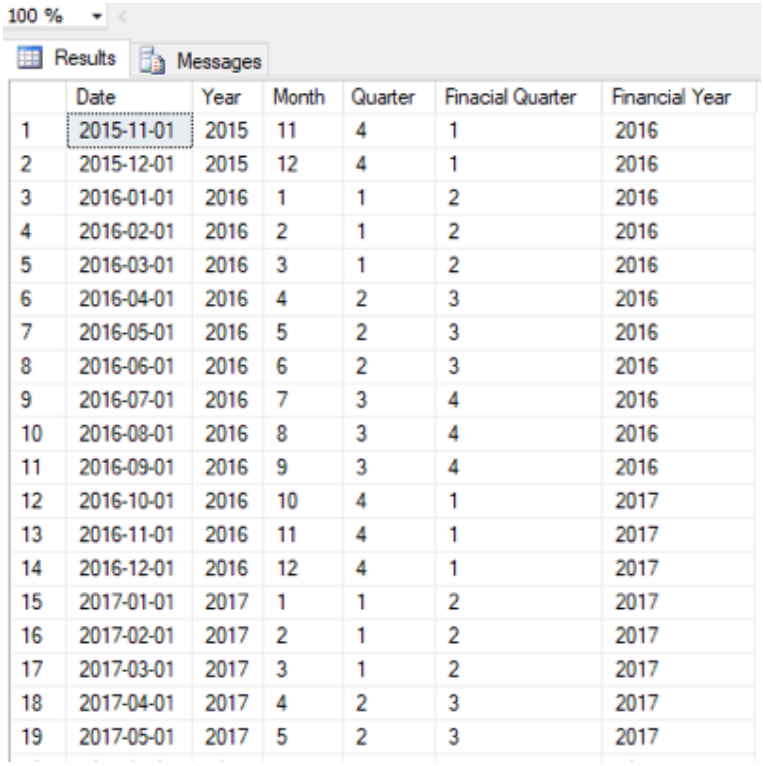
Figure 11: Crime Data FACT Table

Date Data DIMENSION Table

Harnessing the SELECT INTO statement it was possible to create a Date DIMENSION table from the distinct dates in the Crime Data FACT Table.

Harnessing the DATEPART() function it was possible to obtain the [Year], [Month] and [Quarter], when combined with DATEADD() it was also possible to obtain the [Financial Quarter] and the [Financial Year] the code for this is subsequently "DATEPART (QUARTER, DATEADD (MONTH,3,[Date])) [Financial Quarter]" and "YEAR (DATEADD (MONTH,3,[Date])) [Financial Year]".

The Table was subsequently created in the [Model] Schema and can be observed below.



100 %

Results | Messages

	Date	Year	Month	Quarter	Finacial Quarter	Financial Year
1	2015-11-01	2015	11	4	1	2016
2	2015-12-01	2015	12	4	1	2016
3	2016-01-01	2016	1	1	2	2016
4	2016-02-01	2016	2	1	2	2016
5	2016-03-01	2016	3	1	2	2016
6	2016-04-01	2016	4	2	3	2016
7	2016-05-01	2016	5	2	3	2016
8	2016-06-01	2016	6	2	3	2016
9	2016-07-01	2016	7	3	4	2016
10	2016-08-01	2016	8	3	4	2016
11	2016-09-01	2016	9	3	4	2016
12	2016-10-01	2016	10	4	1	2017
13	2016-11-01	2016	11	4	1	2017
14	2016-12-01	2016	12	4	1	2017
15	2017-01-01	2017	1	1	2	2017
16	2017-02-01	2017	2	1	2	2017
17	2017-03-01	2017	3	1	2	2017
18	2017-04-01	2017	4	2	3	2017
19	2017-05-01	2017	5	2	3	2017

Figure 12: Date Data DIMENSION Table

Police Force Data DIMENSION Table

Harnessing the SELECT INTO statement it was possible to create a Police Force Data DIMENSION table from the distinct [Police ID] in the Crime Data FACT Table.

The CASE statement was utilized to enrich the data with the fields [Police Force], [Region] and [County]. An example of the CASE statement used to create the [Region] field is below.

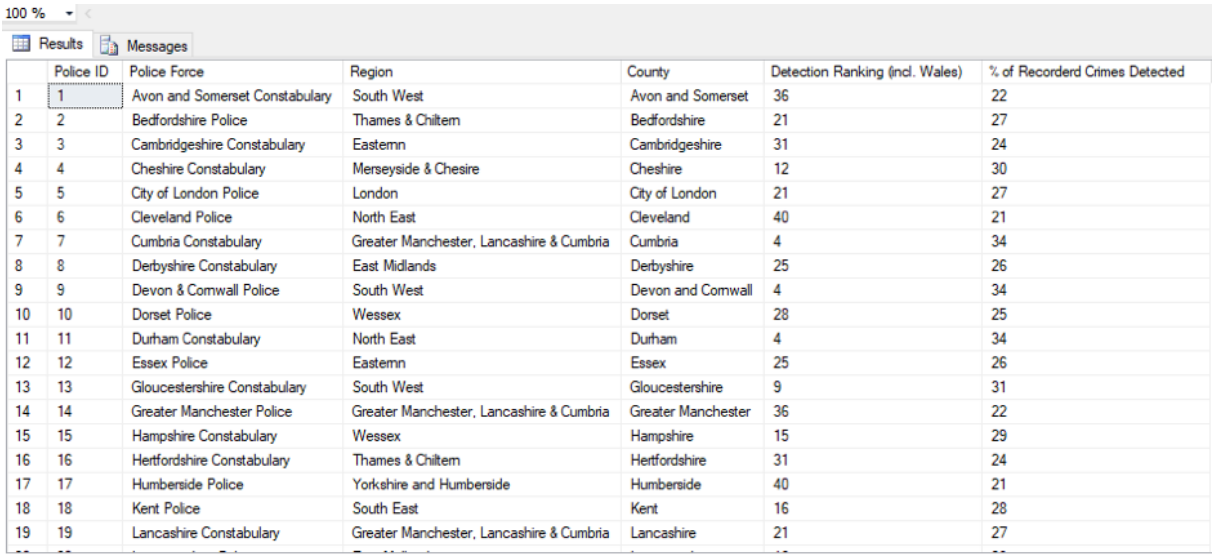
```
,CASE
       WHEN [Police ID] in(18,32,33) then 'South␣East'
       WHEN [Police ID] in(2,16,34) then 'Thames␣&␣Chiltern'
       WHEN [Police ID] in(1,9,13) then 'South␣West'
       WHEN [Police ID] in(10,15,39) then 'Wessex'
       WHEN [Police ID] in(30,35,36,37) then 'West␣Midlands'
       WHEN [Police ID] in(8,20,21,26,28) then 'East␣Midlands'
       WHEN [Police ID] in(3,12,31,24) then 'Easternn'
       WHEN [Police ID] in(22,4) then 'Merseyside␣&␣Chesire␣'
       WHEN [Police ID] in(17,38,29,25) then 'Yorkshire␣and␣Humberside'
       WHEN [Police ID] in(7,14,19) then 'Greater␣Manchester,␣Lancashire␣
          &␣Cumbria'
       WHEN [Police ID] in(6,11,27) then 'North␣East'
       WHEN [Police ID] in(23,5) then 'London'
       ELSE 'N/A'
```

```
END as [Region]
```

Listing 8: Police Force Data DIMENSION Table CASE Example

Additionally, data regarding the [Detection Ranking (incl. Wales)] and [% of Recorded Crimes Detected] obtained from an online source was successfully added using the CASE statement.

The Table was subsequently created in the [Model] Schema and can be observed below.



100 %

Results | Messages

	Police ID	Police Force	Region	County	Detection Ranking (incl. Wales)	% of Recorderd Crimes Detected
1	1	Avon and Somerset Constabulary	South West	Avon and Somerset	36	22
2	2	Bedfordshire Police	Thames & Chiltern	Bedfordshire	21	27
3	3	Cambridgeshire Constabulary	Eastern	Cambridgeshire	31	24
4	4	Cheshire Constabulary	Merseyside & Chesire	Cheshire	12	30
5	5	City of London Police	London	City of London	21	27
6	6	Cleveland Police	North East	Cleveland	40	21
7	7	Cumbria Constabulary	Greater Manchester, Lancashire & Cumbria	Cumbria	4	34
8	8	Derbyshire Constabulary	East Midlands	Derbyshire	25	26
9	9	Devon & Cornwall Police	South West	Devon and Cornwall	4	34
10	10	Dorset Police	Wessex	Dorset	28	25
11	11	Durham Constabulary	North East	Durham	4	34
12	12	Essex Police	Eastern	Essex	25	26
13	13	Gloucestershire Constabulary	South West	Gloucestershire	9	31
14	14	Greater Manchester Police	Greater Manchester, Lancashire & Cumbria	Greater Manchester	36	22
15	15	Hampshire Constabulary	Wessex	Hampshire	15	29
16	16	Hertfordshire Constabulary	Thames & Chiltern	Hertfordshire	31	24
17	17	Humberside Police	Yorkshire and Humberside	Humberside	40	21
18	18	Kent Police	South East	Kent	16	28
19	19	Lancashire Constabulary	Greater Manchester, Lancashire & Cumbria	Lancashire	21	27

Figure 13: Police Force Data DIMENSION Table

Outcome Data DIMENSION Table

Harnessing the SELECT INTO statement it was possible to create an Outcome Data DIMENSION table from the distinct [Outcome ID] in the Crime Data FACT Table.

The CASE statement was utilized to enrich the data with the fields [Outcome Type], [Case Resolved Inclusively] and [5 Scale Severity Rating]. Both the [Case Resolved Inclusively] and [5 Scale Severity Rating] fields were developed from self assessments made on the data.

An example of the CASE statement used to create the [5 Scale Severity Rating] field is below.

```
,CAST(CASE
        WHEN [Outcome ID] in(2,5,15) then 1
        WHEN [Outcome ID] in(4) then 2
        WHEN [Outcome ID] in(1,9,11,13,14) then 3
        WHEN [Outcome ID] in(16) then 4
        WHEN [Outcome ID] in(3,8) then 5
        ELSE 0
END as int) [5 Scale Severity Rating]
```

Listing 9: Outcome Data DIMENSION Table CASE Example

The Table was subsequently created in the [Model] Schema and can be observed below.

100 %

Results | Messages

	Outcome ID	Outcome Type	Case Resolved Inclusively	5 Scale Severity Rating
1	1	Offender given community sentence	True	3
2	2	Offender given conditional discharge	True	1
3	3	Offender given suspended prison sentence	True	5
4	4	Offender given a caution	True	2
5	5	Formal action is not in the public interest	False	1
6	6	Suspect charged as part of another case	False	0
7	7	Local resolution	False	0
8	8	Offender sent to prison	True	5
9	9	Offender given a drugs possession warning	True	3
10	10	Action to be taken by another organisation	False	0
11	11	Offender given penalty notice	True	3
12	12	Offender otherwise dealt with	False	0
13	13	Offender fined	True	3
14	14	Offender ordered to pay compensation	True	3
15	15	Offender given absolute discharge	True	1
16	16	Offender deprived of property	True	4

Figure 14: Outcome Data DIMENSION Table

Crime Type Data DIMENSION Table

Harnessing the SELECT INTO statement it was possible to create a Crime Type Data DIMENSION table from the distinct [Crime Type ID] in the Crime Data FACT Table.

The CASE statement was utilized to enrich the data with the fields [Crime Type], [Crime Category ID], [Felony/Misdemeanor ID], [Victim/Victimless] and [5 Scale Severity Rating]. The fields [Crime Category ID], [Felony/Misdemeanor ID], [Victim/Victimless] and [5 Scale Severity Rating] were developed from self assessments made on the data.

An example of the CASE statement used to create the [Crime Type ID] field is below.

```
CASE [Crime Type ID]
       WHEN 1 then 'Anti-social␣behaviour'
       WHEN 2 then 'Burglary'
       WHEN 3 then 'Vehicle␣crime'
       WHEN 4 then 'Violence␣and␣sexual␣offences'
       WHEN 5 then 'Criminal␣damage␣and␣arson'
       WHEN 6 then 'Other␣theft'
       WHEN 7 then 'Public␣order'
       WHEN 8 then 'Bicycle␣theft'
       WHEN 9 then 'Drugs'
       WHEN 10 then 'Theft␣from␣the␣person'
       WHEN 11 then 'Other␣crime'
```

```
        WHEN 12 then 'Shoplifting'
        WHEN 13 then 'Robbery'
        WHEN 14 then 'Possession␣of␣weapons'
END as [Crime Type]
```

Listing 10: Crime Type Data DIMENSION Table CASE Example

Following the good database practice the fields [Crime Category ID], [Felony/Misdemeanor ID] and [Victim/Victimless] were stored as integers and accordingly had individual LOOKUP tables which provides descriptive data on the ambiguous data in the Crime Type Data DIMENSION Table. Notably, the LOOKUP tables are key to helping maintain data integrity in the database for many users using different report tools to access data.

Subsequently, the three LOOKUP tables [Crime Category ID Data LOOKUP], [Felony/Misdemeanor ID Data LOOKUP] and [Victim/Victimless LOOKUP] were created in the [Model] schema by harnessing the SELECT INTO statement and CASE statement from the Crime Type Data DIMENSION Table.

These three LOOKUP Tables can be observed below.

100 % Results Messages

	Crime Category ID	Crime Category
1	1	Violent Crime
2	2	Property Crime
3	3	Political Crime
4	4	Possession Crime
5	5	Other Crime

100 % Results Messages

	Felony/Misdemeanor	Felony/Misdemeanor ID
1	Felony	2
2	Misdemeanor	1

100 % Results Messages

	Victim/Victimless	Victim/Victimless ID
1	Victim	2
2	Victimless	1

Figure 15: Crime Category ID Data LOOKUP Table, Felony/Misdemeanor ID Data LOOKUP Table and Victim/Victimless LOOKUP Table

The Crime Type Data DIMENSION Table was subsequently created in the [Model] Schema and can be observed below.

	Crime Type ID	Crime Type	Crime Category ID	Felony/Misdemeanor ID	Victim/Victimless ID	5 Scale Severity Rating
1	2	Burglary	2	2	2	4
2	3	Vehicle crime	2	2	2	3
3	4	Violence and sexual offences	1	2	2	5
4	5	Criminal damage and arson	2	2	2	5
5	6	Other theft	2	2	2	2
6	7	Public order	3	2	1	2
7	8	Bicycle theft	2	1	2	1
8	9	Drugs	4	2	1	5
9	10	Theft from the person	2	1	2	2
10	11	Other crime	5	2	2	3
11	12	Shoplifting	2	1	2	1
12	13	Robbery	2	2	2	4
13	14	Possession of weapons	4	2	1	5

Figure 16: Crime Type Data DIMENSION Table

Geography Data DIMENSION Table

The first attempt at creating a Geography Data DIMENSION Table harnessed the SELECT INTO statement as it was possible to create a Geography Data DIMENSION Table from the distinct [LSOA] in the Crime Data FACT Table and the distinct [Region] and [County] in the Police Force Data DIMENSION TABLE.

However, this revealed that some LSOA codes were listed under the incorrect Police Force Area resultantly, duplicates of LSOA codes were listed but under different Police Force Area Names.

For this study it was important to examine exactly were the crime was committed from the [Longitude], [Latitude] and [LSOA Code] therefore, it was important to derive the Police Force Area where the crime had been committed from the [LSOA] code. This led to the importing and cleansing of the LAD to Police Force Data table which has previously been discussed.

A table was created using the SELECT INTO statement from the original Crime Data Table in the [Staged] schema so that it was possible to create a table with both the [LSOA Code] and [LSOA Name]. From the [LSOA Code] and [LSOA Name] it was possible to do further enrichment and derive the [Local Authority District Name], [SOA Layer], [Unique Area Tag], [MSOA Identification] and [Middle SOA Label]. Notably, the [Local Authority District Name] would be key for the in-depth analysis of London Crime. These fields were created by harnessing the SUBSTRING() and REVERSE() functions as shown in the code below.

```
,REVERSE(SUBSTRING(REVERSE(CD.[LSOA Name]),5,50)) [Local Authority
   District Name]
,SUBSTRING(CD.[LSOA Code],2,2) [SOA Layer]
,SUBSTRING(CD.[LSOA Code],4,6) [Unique Area Tag]
,SUBSTRING((REVERSE(CD.[LSOA Name])),1,1) [MSOA Identification]
,REVERSE(SUBSTRING((REVERSE(CD.[LSOA Name])),2,3)) [Middle SOA Label]
```

Listing 11: Geography Data DIMENSION Table SUBSTRING() and REVERSE() Example

The subsequent table was then joined to the LAD to Police Force Data table from the [Staged] schema to determine the corresponding [Police Force Area] for each [Local Authority District Name] which had been derived from the [LSOA Name] field that directly corresponds to the [LSOA Code]. The query example code is as shown below.

```
SELECT DISTINCT
       GP.[LSOA Code]
       ,GP.[LSOA Name]
       ,GP.[Local Authority District Name]
       ,GP.[SOA Layer]
       ,GP.[Unique Area Tag]
       ,GP.[MSOA Identification]
       ,GP.[Middle SOA Label]
```

```
       ,LC.[Region]
       ,LC.[Police Force Area]
FROM [Model].[Geo without Police Force] GP
INNER JOIN Staged.[LAD Conversion] LC
on GP.[Local Authority District Name]=LC.[Local Authority District]
```

Listing 12: Geography Data DIMENSION Table INNER JOIN Example

However, another error was encountered as joins were not being made successfully as both tables consisted of a mixture of 'and' and '&' within in the text. Additionally, issues were also observed as one table listed Northumbria and City of London and the other Northumberland and London City of. Consquently, when working with this data all 'and' were replaced with '&', 'London City of' replaced with 'City of London' and 'Northumberland' replaced with 'Northumbria'. When making joins between tables it was important to repeatedly sense check and count the number of rows to ensure that all joins were successful. It was important to alter the tables before they were joined so that no data was lost, this was primarily done successfully with the REPLACE() function. Below is an example of the use of the REPLACE() function on the derived [Local Authority District] from the [LSOA Name].

```
REPLACE(REPLACE((REVERSE(SUBSTRING(REVERSE([LSOA Name]),5,50)),'␣and␣','␣
   &␣'),'London␣City␣of','City␣of␣London') [Local Authority District]
```

Listing 13: Geography Data DIMENSION Table Formatting Local Authority District Example

Finally it was was possible to create a Geography DIMENSION Table by harnessing the SELECT DISTINCT INTO statement on the inner joined LAD to Police Force Data table and [Geo without Police Force] table which included the [Local Authority District] data derived from the [LSOA Name].

The Geography DIMENSION Table included the fields[LSOA Code], [LSOA Name], [SOA Layer], [Unique Area Tag], [MSOA Identification], [Middle SOA Label], [Region], [Local Authority District ID] and [Police Force Area ID].

Following the database practice the fields [Local Authority District ID] and [Police Force Area ID] were stored as integers and accordingly had individual LOOKUP tables which provides descriptive data on the ambiguous data in the Geography DIMENSION Table. These LOOKUP tables were essential for analysis comparison between and the Knife Crime Data for both England and London.

The CASE statement was utilized to derive the fields [Local Authority District ID] and [Police Force Area ID]. AN example of the CASE statement used to create the [Local Authority District ID] field is below.

```
CASE GP.[Local Authority District]
               WHEN 'Barking␣&␣Dagenham' then 1
               WHEN 'Barnet'    then 2
               WHEN 'Bexley'    then 3
               WHEN 'Brent'    then 4
```

```
                WHEN 'Bromley'    then 5
                WHEN 'Camden'    then 6
                WHEN 'Croydon'    then 7
                WHEN 'Ealing'    then 8
                WHEN 'Enfield'    then 9
                WHEN 'Greenwich'   then 10
                WHEN 'Hackney'    then 11
                WHEN 'Hammersmith␣&␣Fulham' then 12
                WHEN 'Haringey'    then 13
                WHEN 'Harrow'    then 14
                WHEN 'Havering'    then 15
                WHEN 'Hillingdon'   then 16
                WHEN 'Hounslow'    then 17
                WHEN 'Islington'   then 18
                WHEN 'Kensington␣&␣Chelsea' then 19
                WHEN 'Kingston␣upon␣Thames' then 20
                WHEN 'Lambeth'    then 21
                WHEN 'Lewisham'    then 22
                WHEN 'Merton'    then 23
                WHEN 'Newham'    then 24
                WHEN 'Redbridge'   then 25
                WHEN 'Richmond␣upon␣Thames' then 26
                WHEN 'Southwark'   then 27
                WHEN 'Sutton'    then 28
                WHEN 'Tower␣Hamlets'  then 29
                WHEN 'Waltham␣Forest'  then 30
                WHEN 'Wandsworth'   then 31
                WHEN 'Westminster'   then 32
                ELSE '␣'
END as [Local Authority District ID]
```

Listing 14: Geography Data DIMENSION Table CASE Example

The Geography DIMENSION Table was subsequently created in the [Model] Schema and can be observed below.

100 %

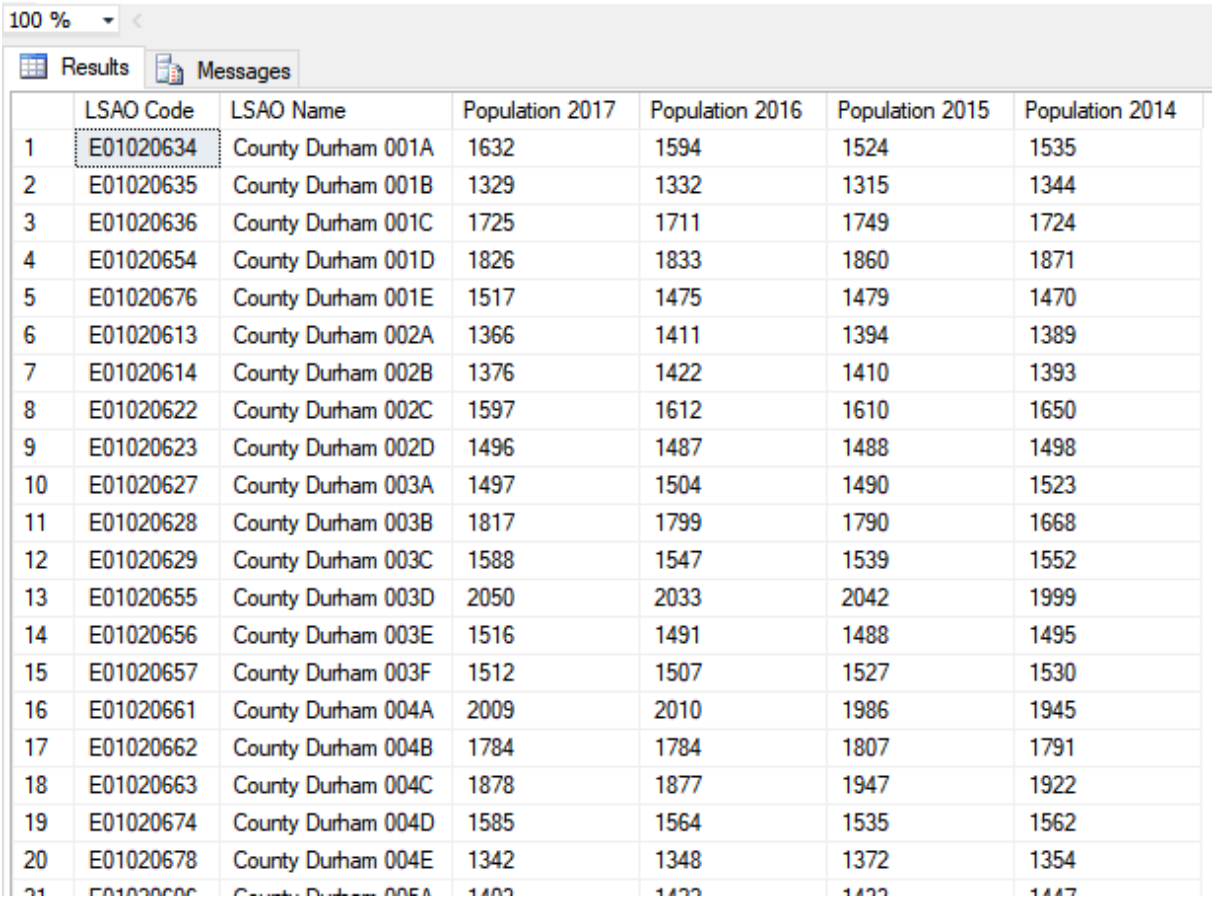
Results | Messages

	LSOA Code	LSOA Name	SOA Layer	Unique Area Tag	MSOA Indetification	Middle SOA Label	Region	Local Authority District ID	Police Force Area ID
1	E01000001	City of London 001A	01	000001	A	001	London Region	0	5
2	E01000002	City of London 001B	01	000002	B	001	London Region	0	5
3	E01000003	City of London 001C	01	000003	C	001	London Region	0	5
4	E01000005	City of London 001E	01	000005	E	001	London Region	0	5
5	E01000006	Barking and Dagenham 016A	01	000006	A	016	London Region	1	23
6	E01000007	Barking and Dagenham 015A	01	000007	A	015	London Region	1	23
7	E01000008	Barking and Dagenham 015B	01	000008	B	015	London Region	1	23
8	E01000009	Barking and Dagenham 016B	01	000009	B	016	London Region	1	23
9	E01000010	Barking and Dagenham 015C	01	000010	C	015	London Region	1	23
10	E01000011	Barking and Dagenham 016C	01	000011	C	016	London Region	1	23
11	E01000012	Barking and Dagenham 015D	01	000012	D	015	London Region	1	23
12	E01000013	Barking and Dagenham 013A	01	000013	A	013	London Region	1	23
13	E01000014	Barking and Dagenham 013B	01	000014	B	013	London Region	1	23
14	E01000015	Barking and Dagenham 009A	01	000015	A	009	London Region	1	23
15	E01000016	Barking and Dagenham 009B	01	000016	B	009	London Region	1	23
16	E01000017	Barking and Dagenham 009C	01	000017	C	009	London Region	1	23
17	E01000018	Barking and Dagenham 009D	01	000018	D	009	London Region	1	23
18	E01000019	Barking and Dagenham 023A	01	000019	A	023	London Region	1	23
19	E01000020	Barking and Dagenham 023B	01	000020	B	023	London Region	1	23

Figure 17: Geography DIMENSION Table

2.4.3 Population Data Enrichment and Model Building

Population Data by LSOA Code was previously successfully imported and cleansed. This data was then inserted into the model as a DIMENSION table to enrich the data from the Crime Data FACT Table. Unfortunately, this data was formatted incorrectly as shown below.



100 %

Results | Messages

	LSAO Code	LSAO Name	Population 2017	Population 2016	Population 2015	Population 2014
1	E01020634	County Durham 001A	1632	1594	1524	1535
2	E01020635	County Durham 001B	1329	1332	1315	1344
3	E01020636	County Durham 001C	1725	1711	1749	1724
4	E01020654	County Durham 001D	1826	1833	1860	1871
5	E01020676	County Durham 001E	1517	1475	1479	1470
6	E01020613	County Durham 002A	1366	1411	1394	1389
7	E01020614	County Durham 002B	1376	1422	1410	1393
8	E01020622	County Durham 002C	1597	1612	1610	1650
9	E01020623	County Durham 002D	1496	1487	1488	1498
10	E01020627	County Durham 003A	1497	1504	1490	1523
11	E01020628	County Durham 003B	1817	1799	1790	1668
12	E01020629	County Durham 003C	1588	1547	1539	1552
13	E01020655	County Durham 003D	2050	2033	2042	1999
14	E01020656	County Durham 003E	1516	1491	1488	1495
15	E01020657	County Durham 003F	1512	1507	1527	1530
16	E01020661	County Durham 004A	2009	2010	1986	1945
17	E01020662	County Durham 004B	1784	1784	1807	1791
18	E01020663	County Durham 004C	1878	1877	1947	1922
19	E01020674	County Durham 004D	1585	1564	1535	1562
20	E01020678	County Durham 004E	1342	1348	1372	1354

Figure 18: Population Data DIMENSION Table Before Formatting

Population Data DIMENSION Table

To perform analysis it was important to have a Population Data DIMENSION table which consisted of 3 fields [LSOA Code], [Population] and [Year] where duplicate entries would be observed under the [LSOA Code] and [Year].

This table was created by creating individual tables for each year by harnessing the SELECT INTO statement on an inner join between the Geography DIMENSION Table in the [Model] schema and the the LSOA Population Table in the [Staged] schema. Below is an example of this code done to create a table consisting only population data from 2017.

```
SELECT
    GD.[LSOA Code]
    ,PD.[Population 2017] [Population]
```

```
into Model.[Population 2017]
FROM [Staged].[LSOA Population] PD
INNER JOIN Model.[Geography Data] GD
on PD.[LSOA Code]=GD.[LSOA Code]
```

Listing 15: Population Data DIMENSION Table Individual Year Table 2017

Then these tables were altered to add a [Year] field with corresponding years inserted. Below is an example of this code to insert the [Year] field for the 2017 population data.

```
ALTER TABLE Model.[Population 2017]
ADD [Year] INT
UPDATE Model.[Population 2017]
SET [Year] = 2017
```

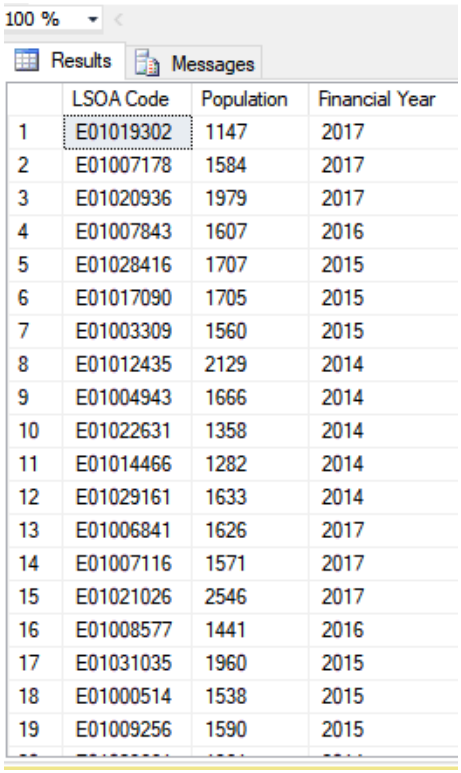
Listing 16: Population Data DIMENSION Table Individual Year Table 2017 Addition of Year Column

Finally the individual tables corresponding to the population data for each year were joined using the UNION() operator. Below is the code used to create the Population Data DIMENSION Table.

```
SELECT
*
into Model.[Population Data]
FROM (
SELECT *
FROM Model.[Population 2017]
UNION
SELECT *
FROM Model.[Population 2016]
UNION
SELECT *
FROM Model.[Population 2015]
UNION
SELECT *
FROM Model.[Population 2014]
)a
```

Listing 17: Population Data DIMENSION Table Individual Year Tables Union

The Population Data DIMENSION Table was subsequently created in the [Model] Schema and can be observed below.


100 %

Results Messages

	LSOA Code	Population	Financial Year
1	E01019302	1147	2017
2	E01007178	1584	2017
3	E01020936	1979	2017
4	E01007843	1607	2016
5	E01028416	1707	2015
6	E01017090	1705	2015
7	E01003309	1560	2015
8	E01012435	2129	2014
9	E01004943	1666	2014
10	E01022631	1358	2014
11	E01014466	1282	2014
12	E01029161	1633	2014
13	E01006841	1626	2017
14	E01007116	1571	2017
15	E01021026	2546	2017
16	E01008577	1441	2016
17	E01031035	1960	2015
18	E01000514	1538	2015
19	E01009256	1590	2015

Figure 19: Population Data DIMENSION Table

2.4.4 Knife Crime Data by Police Force Enrichment and Model Building

Knife Crime Data by Police Force was previously successfully imported and cleansed. This data consists as a FACT Table itself as in analysis it will be used for comparison against data in the Crime Data FACT Table; the data will be linked to the database through the LOOKUP Table where the [Police Force Area ID] and corresponding [Police Force Area Name].

Knife Crime Data by Police Force FACT Table

When creating the Knife Crime Data by Police Force two previously observed problems reoccurred. Firstly, it was important to replace all 'and' with '&', and 'Northumberland' with 'Northumberia'; this was done successfully once again using the REPLACE() function. Secondly, similar to the population data the table was formatted incorrectly as shown.

100 %

Results | Messages

	Police Region	2013/2014 Knife Crime	2013/2014 Knife Crime(per 100,000 population)	2014/2015 Knife Crime	2014/2015 Knife Crime(per 100,000 population)	2015/2016 Knife Crime	2015/2016 Knife Crime(per 100,000 population)
1	Cleveland	200	35	284	50	346	61
2	Durham	131	21	119	19	163	26
3	Northumberland	347	24	427	29	526	36
4	Cheshire	242	23	212	20	247	23
5	Cumbria	104	20	99	19	120	24
6	Greater Manchester	1634	59	1757	64	1791	65
7	Lancashire	644	43	593	40	621	42
8	Merseyside	661	47	672	48	715	51
9	Humberside	324	35	396	42	494	53
10	North Yorkshire	145	17	177	21	220	27
11	South Yorkshire	549	40	546	39	615	45
12	West Yorkshire	1146	50	1233	54	1500	66
13	Derbyshire	350	33	300	29	356	34
14	Leicestershire	444	42	408	39	396	37
15	Lincolnshire	154	21	170	23	211	28
16	Northamptonshire	319	44	305	42	347	48
17	Nottinghamshire	589	52	550	49	585	52
18	Staffordshire	411	36	450	40	515	46

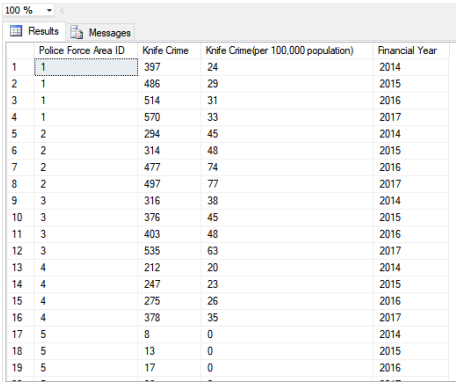
Figure 20: Knife Crime Data by Police Force FACT Table Before Formatting

To perform analysis it was important to have a Knife Crime Data by Police Force FACT table which consisted of 4 fields [Police Force Area ID], [Knife Crime], [Knife Crime(per 100,000 population)] and [Financial Year] where duplicate entries would be observed under the [Police Force Area ID] and [Year]. This was done successfully by employing the same technique observed when creating the Population Data DIMENSION Table by creating individual tables for each year, adding a year field and joining them together using the UNION operator. Notably, when creating the individual yearly tables this involved an inner join with the Geography DIMENSION Table by the [Police Force Area] to obtain the [Police Force Area ID] and ensure the data would successfully correspond when analysis was performed. An example of the code to create the individual yearly tables without the [Year] field is shown below.

```
SELECT DISTINCT
       GD.[Police Force Area ID]
       ,KC.[2013/2014 Knife Crime][Knife Crime]
       ,KC.[2013/2014 Knife Crime(per 100,000 population)] [Knife Crime(
          per 100,000 population)]
into Model.[National Knife Crime 2013/2014 Data]
FROM Model.[Geography Data] GD
INNER JOIN [Model].[Knife Crime Country] KC
on GD.[Police Force Area]=KC.[Police Force Area]
```

Listing 18: Knife Crime Data by Police Force FACT Table Individual Year Table 2013

The Knife Crime Data by Police Force FACT Table was subsequently created in the [Model] Schema and can be observed below.



100 %

Results | Messages

	Police Force Area ID	Knife Crime	Knife Crime(per 100,000 population)	Financial Year
1	1	397	24	2014
2	1	486	29	2015
3	1	514	31	2016
4	1	570	33	2017
5	2	294	45	2014
6	2	314	48	2015
7	2	477	74	2016
8	2	497	77	2017
9	3	316	38	2014
10	3	376	45	2015
11	3	403	48	2016
12	3	535	63	2017
13	4	212	20	2014
14	4	247	23	2015
15	4	275	26	2016
16	4	378	35	2017
17	5	8	0	2014
18	5	13	0	2015
19	5	17	0	2016

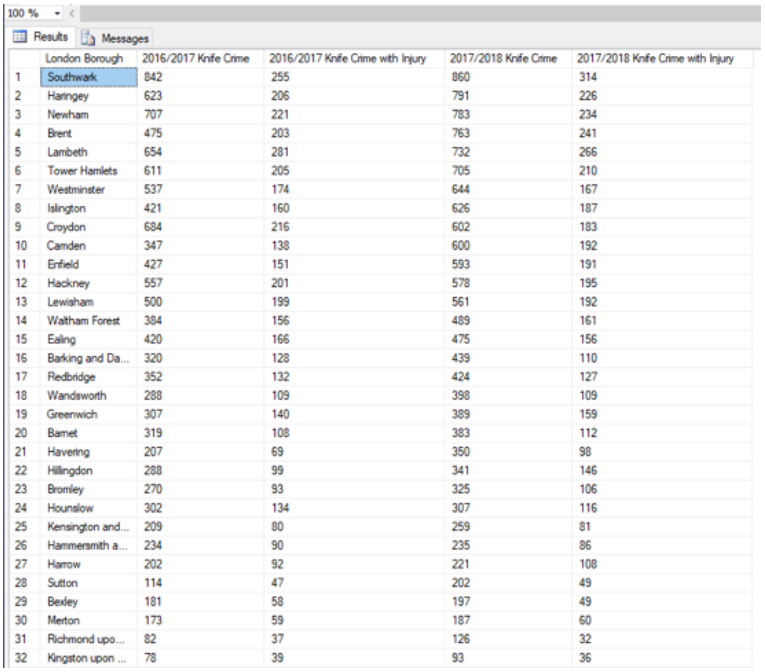
Figure 21: Knife Crime Data by Police Force FACT Table

2.4.5 Knife Crime Data by LAD (London) Enrichment and Model Building

Knife Crime Data by LAD (London) was previously successfully imported and cleansed. This data acts as a FACT Table itself as in analysis it will be used for comparison against data in the Crime Data FACT Table; the data will be linked to the database through the LOOKUP Table where the [Local Authority District ID] and corresponding [Local Authority District Name].

Knife Crime Data by LAD (London) FACT Table

When creating the Knife Crime Data by Police Force two previously observed problems reoccurred. Firstly, it was important to replace all 'and' with '&'; this was done successfully once again using the REPLACE() function. Secondly, similar to the population data the table was formatted incorrectly as shown below.



100 %

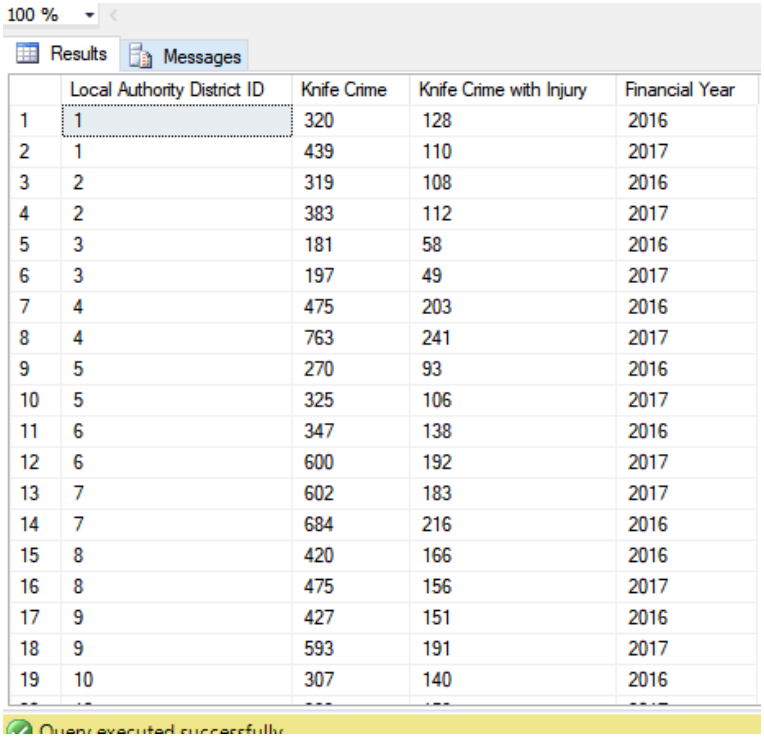
Results | Messages

	London Borough	2016/2017 Knife Crime	2016/2017 Knife Crime with Injury	2017/2018 Knife Crime	2017/2018 Knife Crime with Injury
1	Southwark	842	255	860	314
2	Haringey	623	206	791	226
3	Newham	707	221	783	234
4	Brent	475	203	763	241
5	Lambeth	654	281	732	266
6	Tower Hamlets	611	205	705	210
7	Westminster	537	174	644	167
8	Islington	421	160	626	187
9	Croydon	684	216	602	183
10	Camden	347	138	600	192
11	Enfield	427	151	593	191
12	Hackney	557	201	578	195
13	Lewisham	500	199	561	192
14	Waltham Forest	384	156	489	161
15	Ealing	420	166	475	156
16	Barking and Da...	320	128	439	110
17	Redbridge	352	132	424	127
18	Wandsworth	288	109	398	109
19	Greenwich	307	140	389	159
20	Barnet	319	108	383	112
21	Havering	207	69	350	98
22	Hillingdon	288	99	341	146
23	Bromley	270	93	325	106
24	Hounslow	302	134	307	116
25	Kensington and...	209	80	259	81
26	Hammersmith a...	234	90	235	86
27	Harrow	202	92	221	108
28	Sutton	114	47	202	49
29	Bexley	181	58	197	49
30	Merton	173	59	187	60
31	Richmond upo...	82	37	126	32
32	Kingston upon ...	78	39	93	36

Figure 22: Knife Crime Data by LAD (London) FACT Table Before Formatting

To perform analysis it was important to have a Knife Crime Data by LAD (London) FACT table which consisted of 4 fields [Local Authority District ID], [Knife Crime], [Knife Crime with Injury] and [Financial Year] where duplicate entries would be observed under the [Local Authority District ID] and [Year]. This was done successfully by employing the same technique observed when creating the Population Data DIMENSION Table by creating individual tables for each year, adding a year field and joining them together using the UNION operator. Notably, when creating the individual yearly tables this involved an inner join with the Geography DIMENSION Table by the [Local Authority District] to obtain the [Local Authority District ID] to ensure the data would successfully correspond when analysis was performed.

The Knife Crime Data by LAD (London) FACT Table was subsequently created in the [Model] Schema and can be observed below.


100 %

Results Messages

	Local Authority District ID	Knife Crime	Knife Crime with Injury	Financial Year
1	1	320	128	2016
2	1	439	110	2017
3	2	319	108	2016
4	2	383	112	2017
5	3	181	58	2016
6	3	197	49	2017
7	4	475	203	2016
8	4	763	241	2017
9	5	270	93	2016
10	5	325	106	2017
11	6	347	138	2016
12	6	600	192	2017
13	7	602	183	2017
14	7	684	216	2016
15	8	420	166	2016
16	8	475	156	2017
17	9	427	151	2016
18	9	593	191	2017
19	10	307	140	2016

Query executed successfully.

Figure 23: Knife Crime Data by LAD (London) FACT Table Before Formatting

2.4.6 Important LOOKUP Tables

To perform successful analysis three LOOKUP tables were created to successfully link the data between the Knife Crime Data by LAD (London) FACT table, the Knife Crime Data by Police Force FACT table and the Crime Data FACT Table.

To perform successful analysis by Police Force a Region Data LOOKUP Table was created consisting of fields [Police Force Area ID] and [Police Force Area] and linked successfully to both the Knife Crime Data by Police Force FACT table and the Geography DIMENSION Table. This table was a necessity as these two table had a many to many relationship so could not be linked through keys.

To perform successful analysis by LAD (London) a Region Data LOOKUP Table was created consisting of fields [Local Authority District ID] and [Local Authority District]

and linked successfully to both the Knife Crime Data by LAD (London) FACT table and the Geography DIMENSION Table. This table was a necessity as these two table had a many to many relationship so could not be linked through keys.

To perform successful analysis by Financial Year a Financial LOOKUP Table was created consisting of a field [Financial Year] and linked successfully to the Knife Crime Data by Police Force FACT table, the Knife Crime Data by LAD (London) FACT table, the Population Data DIMENSION Table and the Date Data DIMENSION Table. This table was a necessity as these two table had a many to many relationship so could not be linked through keys.

The code to create these important LOOKUP can be viewed in appendix C.

2.4.7 Adding Primary and Foreign Keys

One of the final steps when building the database model is to successfully link together all the FACT, DIMENSION and LOOKUP tables; this can be done successfully through Primary and Foreign Keys. Primary and oreign keys constrain related data together to ensure data in the database remains consistent and ensures that no redundant data is present within the database.

When creating a primary key the field must by unique and must not contain nulls. The inability to create a primary key on the LSOA Code on the original Geography DIMENSION Table revealed the issue of duplicate LSOA codes under multiple Police Forces. An example of code used to create the primary key in the Crime Data FACT Table is shown below illustrating how the table was altered to fit primary key requirements.

```
ALTER TABLE [Model].[Crime Data]
ALTER COLUMN [Crime ID] INT NOT NULL
ALTER TABLE [Model].[Crime Data]
ADD PRIMARY KEY ([Crime ID])
```

Listing 19: Adding Primary Keys

Creating foreign keys requires a many to one relationship and was done successfully using the code as shown below between the Crime Data FACT Table and Date Data DIMENSION Table.

```
ALTER TABLE [Model].[Crime Data]
ADD FOREIGN KEY ([Date])
REFERENCES [Model].[Date Data] ([Date])
```

Listing 20: Adding Foreign Keys

Foreign Keys were also created with nocheck where there was not a match for all the data observed in the two columns from the two separate tables. This can be observed with the [Local Authority District ID] field in the Geography DIMENSION Table as Local Authority District LOOKUP Table only contains information for London. An example of this code is as shown below.

```
ALTER TABLE [Model].[Geography Data] with nocheck
ADD FOREIGN KEY ([Local Authority District ID])
REFERENCES [Model].[Local Authority District]([Local Authority District
    ID])
```

Listing 21: Adding Foreign Keys with nocheck

The code to create these keys can be viewed in appendix D.

2.4.8 Organization and Renaming within the Database Model

Before the database model could be efficiently harnessed in analysis it was important to remove any tables which had been part of the process of building the model to a 'Trash' schema. A schema was created named [Building Schema] and all tables not part of the model where moved here using the code as shown below.

```
ALTER SCHEMA [Building Model]
TRANSFER [Model].[Lad Conversion]
```

Listing 22: Moving Tables Between Schemas

The full code for moving tables into the [Building Schema] can be viewed in appendix E. Additionally the tables from the [Staged] Schema were also renamed with a S before their name to distinguish them as the cleaned raw data.

The tables in the Model were also renamed to correspond to their Titles in this study so that the Database Model is usable for any new user.

2.5 Model Review

The final Database Model is as shown in the Database Diagram below.

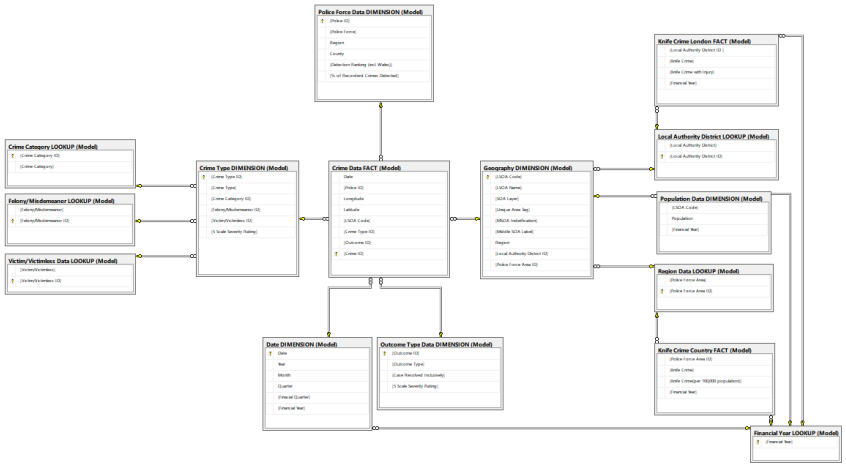


Figure 24: Database Model

Using the Database Diagram it is also possible to evaluate Database Model datatypes as shown below.

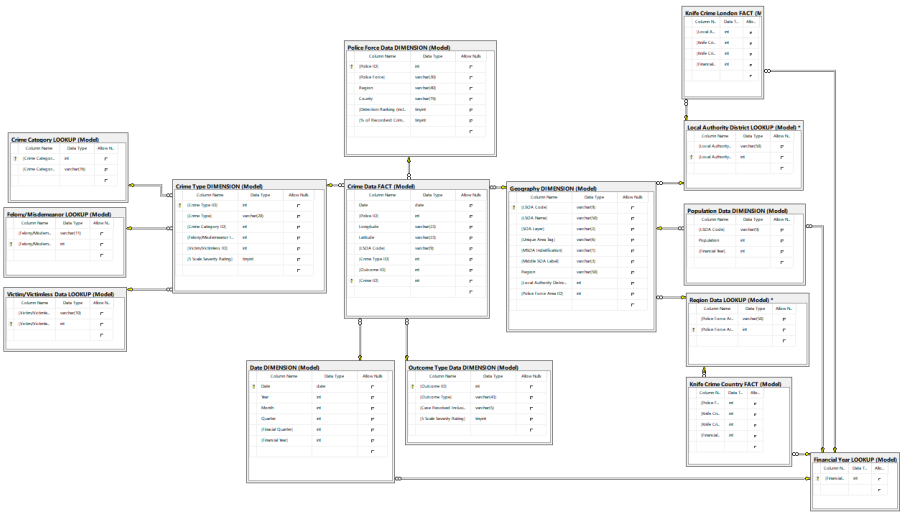


Figure 25: Database Model Datatype

To have a true snowflake schema the database would have to include further normalization, for example the [MSOA Identification] field under the [Geography DIMENSION Table] should be an ID and have a corresponding LOOKUP table. If given more time further normalization would be possible however was not crucial for this study.

Additionally, the table [Population Data DIMENSION Table] was placed in the Database Model to allow for analysis of crime per head however, was not needed when performing

analysis. The table however was not removed from the model as it would be key for another user if they wanted to examine rankings etc. This model contains notable relevant data which was subsequently not used in analysis but could be used by another user for further analysis.

3 Model Analysis

3.1 Creating Views

Views are important in database models for data analysis but also for several other reasons:

1. Views can hide complexity of the database schema and provide access to data which may can only be shown by complex joins.
2. Views are helpful for viewing aggregated information like totals, differences, minimums, maximums, averages and percentages.
3. Views act as security mechanisms restricting access to tables and specified fields within a database which may need to be protected.
4. Views can simplify supporting legacy code if you need to alter a table that would break a lot of code it is possible to replace the table with a view of the same name and ensures that the legacy code is not altered.

Views were created primarily to hide the complexity of the inner joins and clearly display the aggregated information to be inputted into Tableau for analysis.

Each view was created containing the Average Punishment Severity grouped by the Analysis Field(ie.[Crime Type]) and Location(ie. [Police Force Area]) to ensure that no increased crime rates were caused by unsuitable punishments at a set location. The Analysis Field was then aggregated to count the total number of crimes by the Analysis Field(ie.[Crime Type]) and Location(ie. [Police Force Area]). Additionally an Average Crime Severity grouped by the Analysis Field(ie.[Crime Type]) and Location(ie. [Police Force Area]) for this study was also produced in a view with the other corresponding information.The inclusion of the [Financial Year], Location and Analysis Field were also key for potential filtering during analysis.

The views were created with the aim to plot knife crime incidents against the Analysis Fields Crime Type, Crime Category, Felony/Misdemeanor and Average Crime Severity to observe whether there are any correlations between the data which, may indicate the crimes which subsequently cause knife crime. Population data was not necessary to use for the performed analysis as the Knife Crime Incidents where plotted against data for the same location where the population would be the same; these studies examined the correlation between data not specific information about the corresponding locations.

The code to create the views is shown in the appendix F and an example of the view code used is shown below.

```
CREATE VIEW CrimeTypeComparisonEngland AS
SELECT Distinct
       FYL.[Financial Year] [Financial Year]
         ,COUNT(CTD.[Crime Type]) OVER(PARTITION by [Crime Type], [Police
             Force Area]) [Reported Offences Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as FLOAT)) OVER (
            PARTITION by [Crime Type], [Police Force Area]) [Reported
            Offences Punishment Severity]
         ,RDL.[Police Force Area] [England Police Force Area]
```

```
        ,CTD.[Crime Type]
        ,KCCD.[Knife Crime] [Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DDwa
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Region Data LOOKUP] RDL
on GD.[Police Force Area ID]=RDL.[Police Force Area ID]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN[Model].[Knife Crime Country DIMENSION] KCCD
on RDL.[Police Force Area ID]=KCCD.[Police Force Area ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCCD.[Financial Year]=FYL.[Financial Year];
```

Listing 23: Creating Views

The resulting views were displayed in the database as shown below.

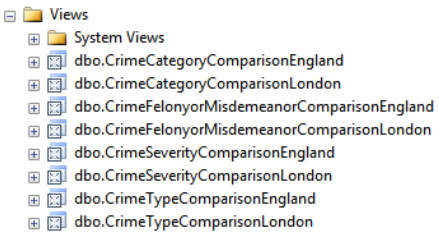


Figure 26: View Tables

3.2 Tableau Analysis

Tableau was harnessed for data analysis and data visualization; an interactive dashboard was created which can be viewed by the link Dashboard or can be viewed at a glance below.

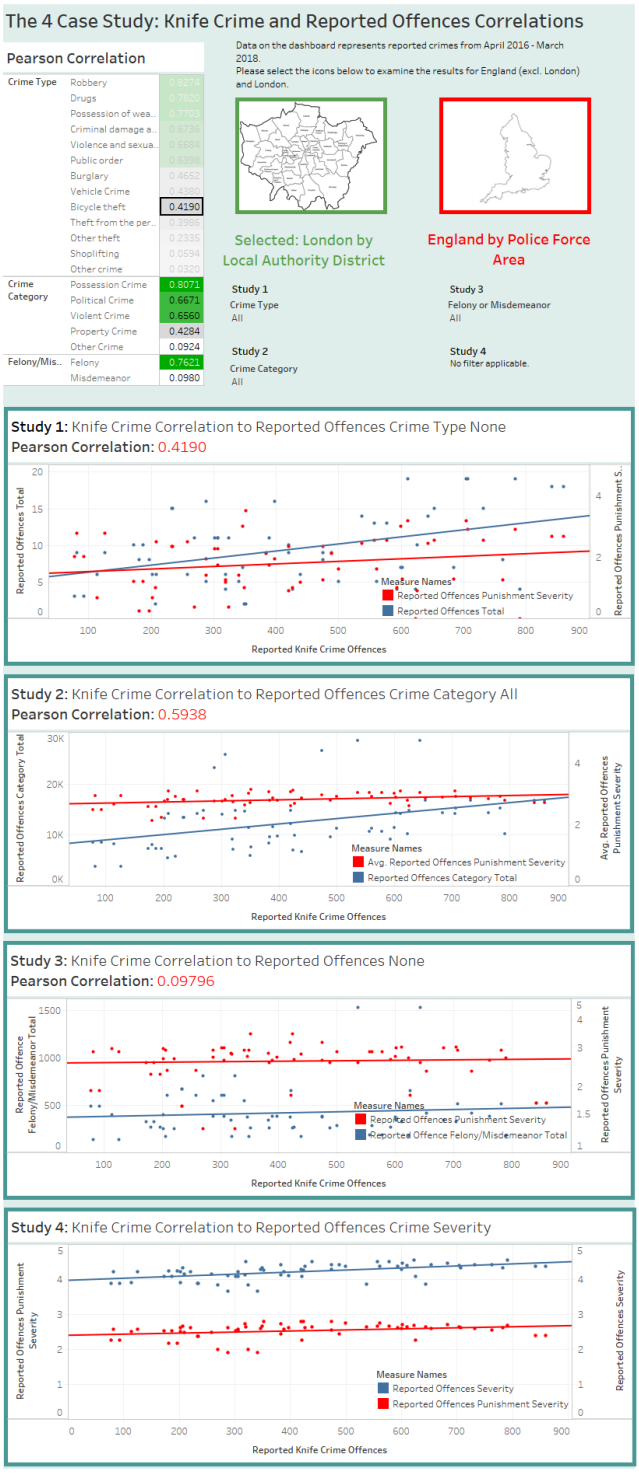


Figure 27: Dashboard

The dashboard contains buttons which allows for the user to switch between the results for London by Local Authority District and England by Police Force Area.

Each Study graph follows the same colouring and format for consistency with titles that alter depending on the filter and the Pearson Correlation. All graphs consist of the x axis Reported Knife Crime Offences and the y axis Reported Offences Average Punishment Severity; Punishment Severity was included in all graphs to ensure inconsistent punishment of crimes were not altering the results. When hovering over any point the Location, Year, Reported Knife Crime Offences, additional y axis and Correlation will be displayed. Additionally for each graph two trend lines are observed for both the Punishment Severity and the additional y axis which when hovered over display the lines calculation, R squared and P value. The Pearson correlation was determined by applying a calculation field harnessing the WINDOW CORR function.

A table present in the top left side of the dashboard displays all the Pearson Correlations for each Study in order by each study with a colour gradient. It is possible to alter the view of the study tables by either selection through the Pearson Correlation Table or by the the drop down selections observed below the buttons.

3.3 Infographic

The final infographic was designed in Easel for print out purposes. This can be viewed with a higher quality a the link Infographic and is also shown at a lower quality below.

Figure 28: Infographic

3.4 Analysis Results

The analysis includes 4 studies titled "Study 1: Knife Crime Correlations to Reported Crime Type","Study 2: Knife Crime Correlations to Reported Crime Category", "Study 3: Knife Crime Correlations to Reported Felony or Misdemeanor" and "Study 4: Knife Crime Correlations to Reported Average Crime Severity".The analysis of Knife Crime Incidents against the Analysis Fields Crime Type, Crime Category, Felony/Misdemeanor and Average Crime Severity was performed to find potential correlations.

The Pearson Correlation was calculated using the WINDOW CORR function which is also known as the "product moment correlation coefficient" (PMCC) and is only suitable for metric values. When applying the Pearson Correlation 3 assumptions are made:

1. The data set observations are independent.
2. The population correlation equals zero.
3. The 2 data set are bivariately normally distributed in the population.

A correlation values near -1 represents data that is perfectly negatively linearly related and a correlation values near 1 represents data that is perfectly positively linearly related. A correlation of 0 means that the two sets of data have no linear relationship. For this study strong correlations would be either close to 1 or -1.

The correlation of Knife Crime to the Analysis Fields is key to revealing potential crimes which may be linked or even causing Knife Crime. Reducing Knife Crime may be possible by tackling the crimes that that are linked to knife crime.

The analysis was performed on crime data from April 2016 to March 2018 as Knife Crime Incidents has sparked media attention in the last two years. The analysis was performed for the whole of England by Police Force (excl. London) and London by Local Authority District. The punishment severity for the Analysis Field was also plotted against the number of Knife Crime Incidents to ensure crimes rates were not being affected by inconsistent punishments by locations.

Population data was not necessary to use for the performed analysis as the Knife Crime Incidents where plotted against data for the same location where the population would be the same; these studies examined the correlation between data not specific information about the corresponding locations.

Knife Crime and Crime in London is greatly disproportionate to the rest of England and consequently was skewing the data analysis on England. Subsequently, Knife Crime and Crime Data for London was removed from the data analysis on England as this large difference in knife crime indicates potential separate causes. A graph displaying the knife crime across England including London is as shown below to display the large difference.

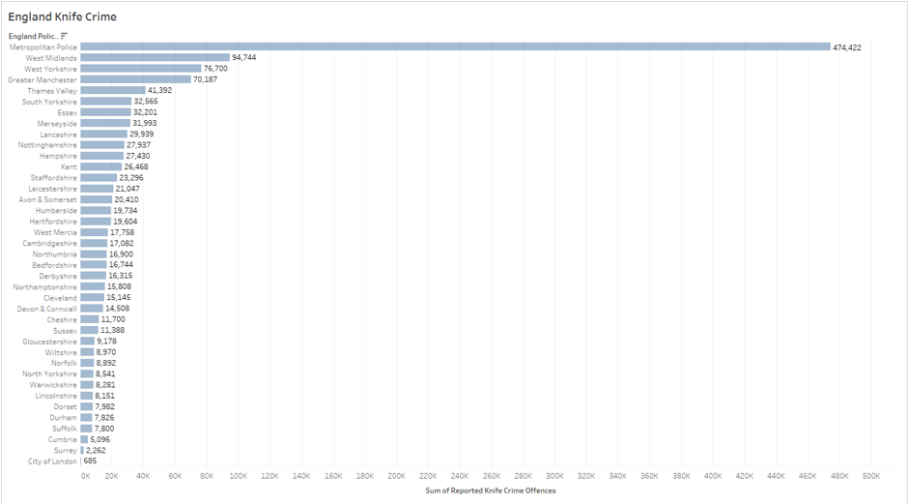


Figure 29: England Knife Crime by Police Force between 04/16 - 03/18

3.4.1 Study 1: Knife Crime Correlations to Reported Crime Type

London by Local Authority District

No issues with punishment severity were observed for for this analysis.

The Pearson Correlations for each Crime Type to Knife Crime are as shown in the table below.

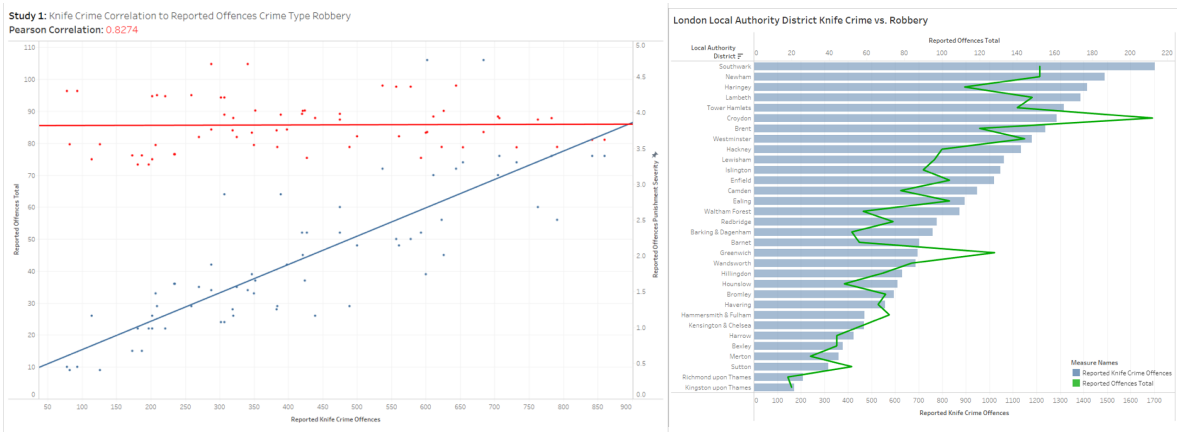
Table 1: Pearson Correlations for London by Crime Type

Crime Type	Pearson Correlation
Robbery	0.8274
Drugs	0.7820
Possession of weapons	0.7703
Criminal damage and arson	0.6736
Violence and sexual offences	0.6684
Public order	0.6398
Burglary	0.4652
Vehicle Crime	0.4380
Bicycle theft	0.4190
Theft from the person	0.3986
Other theft	0.2335
Shoplifting	0.0594
Other crime	0.0320

The top 3 correlations were observed for Robbery, Drugs and Possession of Weapons.

Robbery observed a correlation of 0.8274 and the trend line depicts the relationship between the two sets of data as 'Reported Robberies = (0.0887362 x Reported Knife Crime Offences) + 6.50766'. Plotting the Knife Crime Incidents and Reported Robberies revealed parts of London which do not directly correspond to the trend including Haringey,

Croydon and Greenwich. Both graphs which illustrate the trend and the anomalies are shown below.

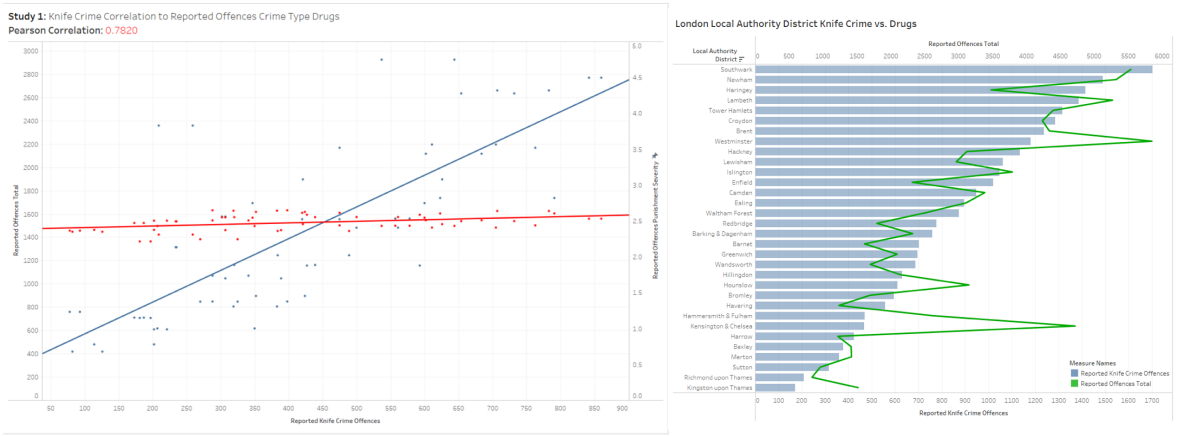


(a) Pearson Correlation between Knife Crime and Robberies

(b) Knife Crime and Robberies by Local Authority District

Figure 30: Knife Crime and Robberies Offences by Local Authority District between between 04/16 - 03/18

Drugs observed a correlation of 0.7820 and the trend line depicts the relationship between the two sets of data as 'Reported Drug Crimes = (2.7242 x Reported Knife Crime Offences) + 296.727'. Plotting the Knife Crime Incidents and Reported Drug Crimes revealed parts of London which do not directly correspond to the trend including Westminster and Newham. Both graphs which illustrate the trend and the anomalies are shown below.



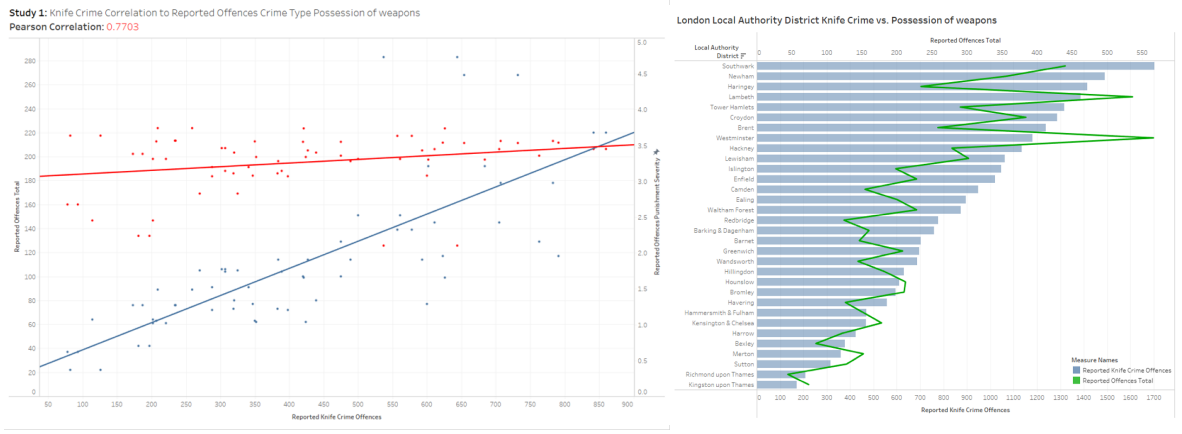
(a) Pearson Correlation between Knife Crime and Drugs Crime

(b) Knife Crime and Drugs Crime by Local Authority District

Figure 31: Knife Crime and Drugs Crime Offences by Local Authority District between between 04/16 - 03/18

Possession of weapons observed a correlation of 0.7703 and the trend line depicts the relationship between the two sets of data as 'Reported Possessions = (0.22655 x Reported

Knife Crime Offences) + 16.0632'. Plotting the Knife Crime Incidents and Reported Possession of Weapons revealed parts of London which do not directly correspond to the trend including Haringey, Brent and Westminster. Both graphs which illustrate the trend and the anomalies are shown below.



(a) Pearson Correlation between Knife Crime and Possession of Weapons

(b) Knife Crime and Possession of Weapons by Local Authority District

Figure 32: Knife Crime and Possession of Weapons Offences by Local Authority District between between 04/16 - 03/18

England by Police Force(excl. London)

No issues with punishment severity were observed for for this analysis.

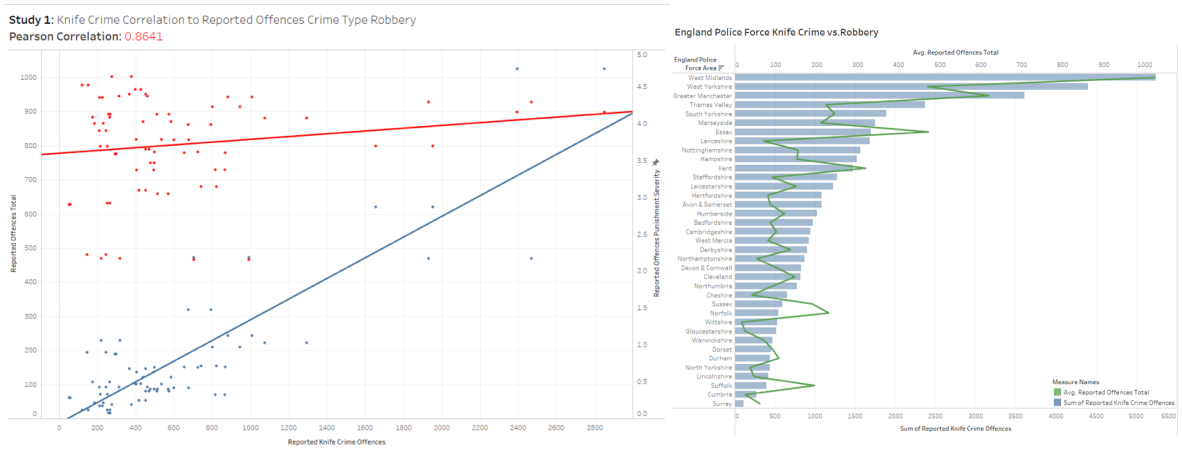
The Pearson Correlations for each Crime Type to Knife Crime are as shown in the table below.

Table 2: Pearson Correlations for England by Crime Type

Crime Type	Pearson Correlation
Robbery	0.8641
Shoplifting	0.8247
Burglary	0.7514
Theft from the person	0.7424
Criminal damage and arson	0.7205
Vehicle Crime	0.6927
Violence and sexual offences	0.6574
Public order	0.6452
Possession of weapons	0.6055
Drugs	0.5951
Other crime	0.5700
Other theft	0.5612
Bicycle theft	0.4208

The top 3 correlations were observed for Robbery, Shoplifting and Burglary. Robbery observed a correlation of 0.8641 and the trend line depicts the relationship between the

two sets of data as 'Reported Robberies = (0.303065 x Reported Knife Crime Offences) - 13.9647'. Plotting the Knife Crime Incidents and Reported Robberies revealed parts of England which do not directly correspond to the trend including Wiltshire, Norfolk and Lancashire. Both graphs which illustrate the trend and the anomalies are shown below.

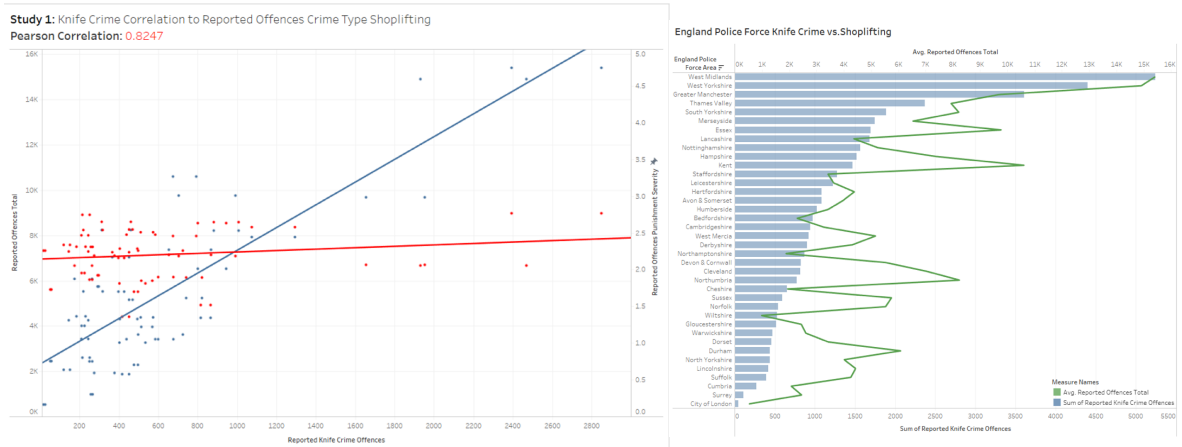


(a) Pearson Correlation between Knife Crime and Robbery

(b) Knife Crime and Robbery by Local Authority District

Figure 33: Knife Crime and Robbery by Police Force between between 04/16 - 03/18

Shoplifting observed a correlation of 0.8247 and the trend line depicts the relationship between the two sets of data as 'Reported Shoplifting = (5.02304 x Reported Knife Crime Offences) + 2314.84'. Plotting the Knife Crime Incidents and Reported Shoplifting revealed parts of England which do not directly correspond to the trend including Cleveland, Kent and Durham. Both graphs which illustrate the trend and the anomalies are shown below.



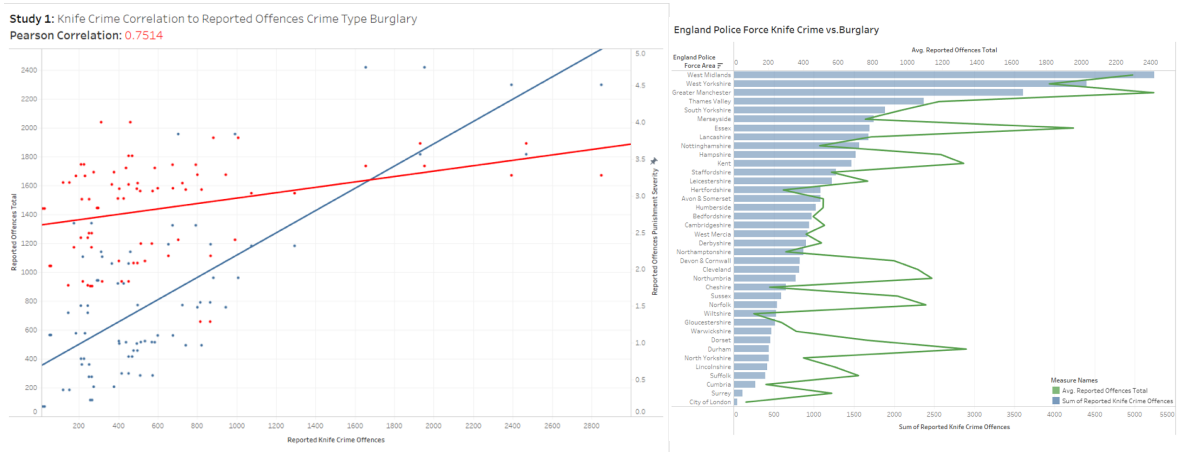
(a) Pearson Correlation between Knife Crime and Shoplifting

(b) Knife Crime and Shoplifting by Local Authority District

Figure 34: Knife Crime and Shoplifting by Police Force between between 04/16 - 03/18

Burglary observed a correlation of 0.7514 and the trend line depicts the relationship between the two sets of data as 'Reported Burglary =(0.770949 x Reported Knife Crime

Offences) + 345.289'. Plotting the Knife Crime Incidents and Reported Burglaries revealed parts of England which do not directly correspond to the trend. Both graphs which illustrate the trend and the anomalies are shown below.



(a) Pearson Correlation between Knife Crime and Burglary

(b) Knife Crime and Burglary by Local Authority District

Figure 35: Knife Crime and Burglary by Police Force between between 04/16 - 03/18

3.4.2 Study 2: Knife Crime Correlations to Reported Crime Category

London by Local Authority District

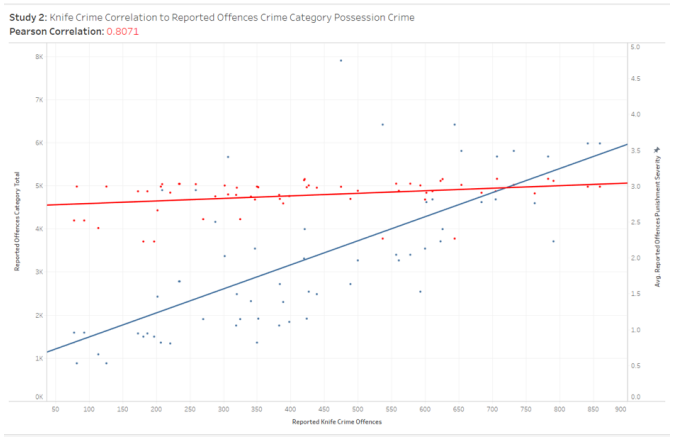
No issues with punishment severity were observed for for this analysis.

The Pearson Correlations for each Crime Category to Knife Crime are as shown in the table below.

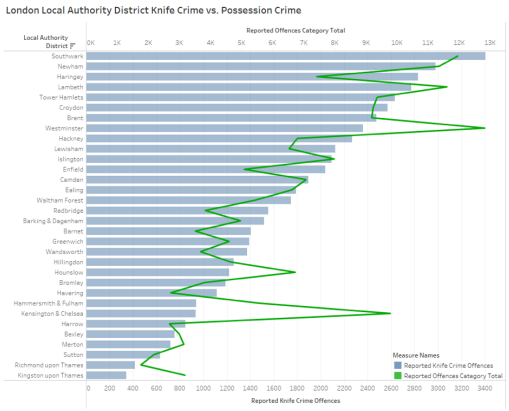
Table 3: Pearson Correlations for London by Crime Category

Crime Category	Pearson Correlation
Possession Crime	0.8071
Political Crime	0.6671
Violent Crime	0.6560
Property Crime	0.4284
Other Crime	0.0924

The top correlation was observed for Possession Crime at 0.8071 and the trend line depicts the relationship between the two sets of data as 'Reported Offences Category Total = (5.58115 x Reported Knife Crime Offences) + 928.66'.Plotting the Knife Crime Incidents and Reported Possession Crimes revealed parts of London which do not directly correspond to the trend. Both graphs which illustrate the trend and the anomalies are shown below.



(a) Pearson Correlation between Knife Crime and Possession Crimes



(b) Knife Crime and Possession Crimes by Local Authority District

Figure 36: Knife Crime and Possession Crimes by Local Authority District between between 04/16 - 03/18

England by Police Force(excl. London)

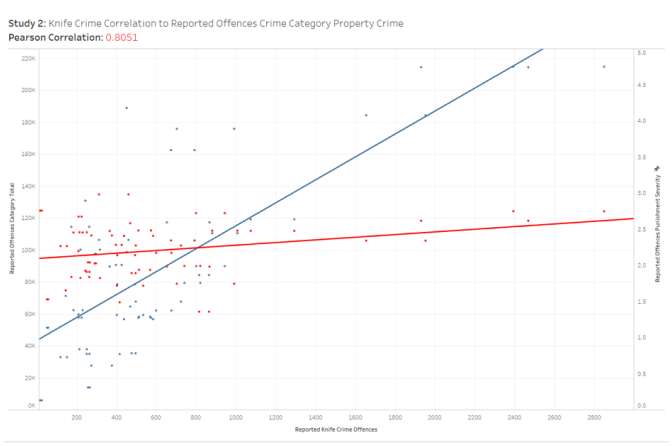
No issues with punishment severity were observed for for this analysis.

The Pearson Correlations for each Crime Category to Knife Crime are as shown in the table below.

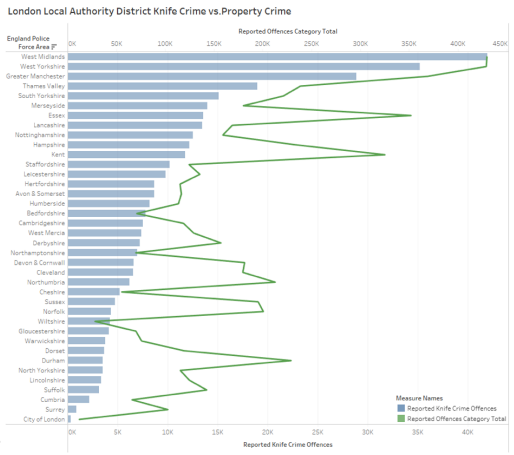
Table 4: Pearson Correlations for England by Crime Category

Crime Category	Pearson Correlation
Property Crime	0.8051
Violent Crime	0.6532
Political Crime	0.6434
Possession Crime	0.6267
Other Crime	0.5666

The top correlation was observed for Property Crime at 0.8051 and the trend line depicts the relationship between the two sets of data as 'Reported Offences Category Total = (87.9531 x Reported Knife Crime Offences) + 54951.9'.Plotting the Knife Crime Incidents and Reported Property Crimes revealed parts of London which do not directly correspond to the trend. Both graphs which illustrate the trend and the anomalies are shown below.



(a) Pearson Correlation between Knife Crime and Property Crimes



(b) Knife Crime and Property Crimes by Local Authority District

Figure 37: Knife Crime and Property Crimes by Police Force between between 04/16 - 03/18

3.4.3 Study 3: Knife Crime Correlations to Reported Felony or Misdemeanor

London by Local Authority District

No issues with punishment severity were observed for for this analysis.

The Pearson Correlations for both Misdemeanors and Felonies to Knife Crime are as shown in the table below.

Table 5: Pearson Correlations for London by Felony/Misdemeanor

Felony/Misdemeanor	Pearson Correlation
Felony	0.7621
Misdemeanor	0.0980

On further examination it was decided that these fields where to broad to provide reliable results that could be harnessed to tackle knife crime.

England by Police Force(excl. London)

No issues with punishment severity were observed for for this analysis.

The Pearson Correlations for both Misdemeanors and Felonies to Knife Crime are as shown in the table below.

Table 6: Pearson Correlations for England by Felony/Misdemeanor

Felony/Misdemeanor	Pearson Correlation
Misdemeanor	0.8250
Felony	0.7051

On further examination it was decided that these fields where to broad to provide reliable results that could be harnessed to tackle knife crime.

3.4.4 Study 4: Knife Crime Correlations to Reported Average Crime Severity

London by Local Authority District

No issues with punishment severity were observed for for this analysis. No notable trends were observed between the two data sets as is shown by the graph below.

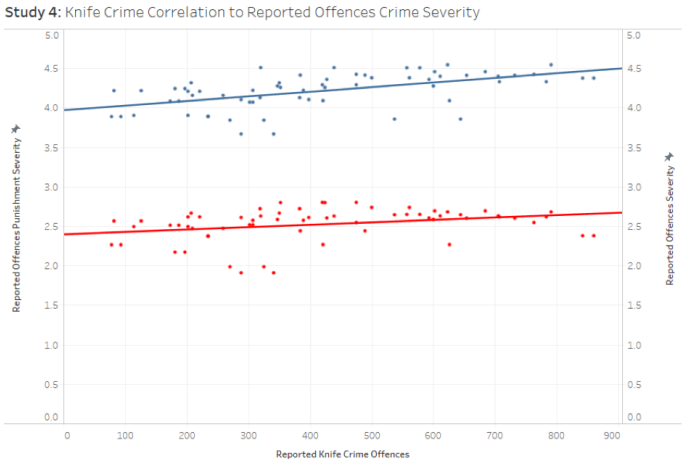


Figure 38: London Knife Crime by Local Authority District against Reported Average Crime Severity between 04/16 - 03/18

England by Police Force(excl. London)

No issues with punishment severity were observed for for this analysis. No notable trends were observed between the two data sets as is shown by the graph below.

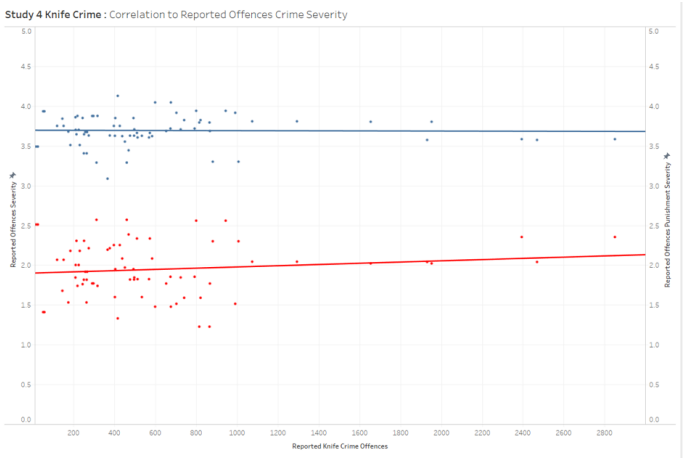


Figure 39: England Knife Crime by Police Force against Reported Average Crime Severity between 04/16 - 03/18

3.5 Analysis Review

For London a clear correlation of 0.8071 was observed between Knife Crime and Possession Crimes(a crime of possessing illegal items), this was further supported by the top crime type correlations Possession of Weapons and Drugs both being Possession crimes. Notably, the highest crime type correlation was observed with Robbery but it's category Property Crime only observes a correlation of 0.4284. Analysis suggests that across London possession crimes are either linked to or cause Knife Crimes, a possible way to reduce knife crimes across London could be with initiatives to reduce possession crimes. Notably, possession crimes are commonly linked to gangs similar to knife crimes, a possible solution to reducing knife crime is to tackle London gang culture.

For England a clear correlation of 0.8051 was observed between Knife Crime and Property Crimes(a crime to obtain money, property, or some other benefit) this was further supported by the top 3 crime type correlations Robbery, Shoplifting and Burglary are all being Property crimes.The crime type with the lowest correlation was Bicycle Theft. Analysis suggests that across England property crimes are either linked to or cause Knife Crimes a possible way to reduce knife crimes across England could be with increased security and initiatives to reduce property crimes.

Analysis revealed that The Pearson Correlations for both Misdemeanors and Felonies to Knife Crime are not reliable and no trends are observed between Knife Crime and Reported Average Crime Severity.

4 Study Conclusion and Policy Implications

To conclude a snowflake schema database model was successfully designed to perform 4 studies "Study 1: Knife Crime Correlations to Reported Crime Type", "Study 2: Knife Crime Correlations to Reported Crime Category", "Study 3: Knife Crime Correlations to Reported Felony or Misdemeanour" and "Study 4: Knife Crime Correlations to Reported Average Crime Severity". The database model only consisted of crimes with known locations, convicted outcomes and that took place within England. Interestingly the crime type "Anti-Social Behaviour" was not included in the model as no outcomes were given for this crime type.

Analysis was performed for the data between April 2016 to March 2017 for London by Local Authority District and England by Police Force (excl. London), the punishment severity was included to ensure that inconsistent punishments were not affecting the number of crimes by location. The results of the analysis were visualized as graphs, in a dashboard on Tableau and as an infographic.

Analysis revealed that the studies 3 and 4 provided insufficient and unreliable results which cannot help to assist the development of new policies to tackle Knife Crime.

The London analysis revealed a strong correlation between Knife Crime and Possession Crimes including Possession of Weapons and Drug related crimes. Additionally, a strong correlation was observed between Robberies and Knife crime. These strong correlations indicate possible causes and links between these crimes and knife crime; notably these are also linked to gang culture.

The England (excl. London) analysis revealed a strong correlation between Knife Crime and Property Crimes including Robbery, Shoplifting and Burglary crimes which independently also had strong correlations to Knife Crime. These strong correlations indicate possible causes and links between Property Crimes and Knife Crime.

Correlations do not explicitly reveal causes however, this study provides insight as areas of London which experience high levels of Possession Crimes and Robberies also experience high levels of Knife Crime whilst, for the rest of England areas which experience high levels of Property Crimes also experience high levels of Knife Crime. Further examination of these crimes may further reveal their links to Knife Crimes potentially providing information that allows for the development of new polices to tackle these crimes, to reduce Knife Crime and save lives.

5 Future Work

Further analysis on the current database model could examine the knife crime per head and the crimes that have been found to have strong correlations per head to determine where in London and England these crimes are worse. Further analysis could also be performed to examine the areas where the correlation did not as strongly apply; for these areas it may be possible to examine which crimes are prevalent and if these crimes have any relation to the knife crime statistics in these areas.

Additionally the current database also allows for possible expansion and filtering of results by regions such as the South East, the East Midlands, the North West etc. to examine whether the correlations between crime and knife crimes alter depending on the area of the country. If it were possible to obtain all Knife Crime data by every Local Authority District in the country an in depth study as performed on London would be possible for every Police Force Area; this could potentially provide information on how knife crime correlations alter depending on location in England.

Further work would involve a closer inspection to between the crimes that had the highest correlations to fully understand possible links and causes so that appropriate policies could be implemented to reduce knife crimes.

6 Data Source

Local Authority District to Police Force
https://www.gov.uk/government/statistics/police-recorded-crime-open-data-tables

Population
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimates

Reported Offences
https://data.police.uk/

Police Rating Info
https://www.theguardian.com/observer/secondterm/table/0,8173,609883,00.html

Knife Crime
https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN04304

Appendices

A Model Cleansing

```
--Cleaning

-- Reported Offences

SELECT DISTINCT
[Crime ID]
       ,CAST(CONCAT ([Month],-01) as DATE) [Date]
     ,LTRIM([Falls within]) [Police Force]
     ,LTRIM(try_CAST([Longitude] as FLOAT)) [Longitude]
     ,LTRIM(try_CAST([Latitude] as FLOAT)) [Latitude]
     ,LTRIM(CAST([LSOA code] as VARCHAR(9))) [LSOA Code]
     ,LTRIM(CAST([LSOA name] as VARCHAR(50))) [LSOA name]
     ,LTRIM([Crime type]) [Crime]
     ,LTRIM([Last outcome category]) [Outcome]
INTO [Staged].[Crime Data with Original Crime ID]
  FROM [dbo].[Full Crime Data]
  WHERE [Crime ID] is not null
and [Last outcome category] not in ('Under␣investigation','Further␣
   investigation␣is␣not␣in␣the␣public␣interest','Court␣case␣unable␣to␣
   proceed','Status␣update␣unavailable','Investigation␣complete;␣no␣
   suspect␣identified','Court␣result␣unavailable','Unable␣to␣prosecute␣
   suspect','Defendant␣found␣not␣guilty','Awaiting␣court␣outcome')
and [Location] != 'No␣Location'
and substring([LSOA Code],1,1) not in ('K','S','N','W')
and [Falls within] not in ('Dyfed-Powys␣Police','South␣Wales␣Police')
and [Crime type] = 'Anti-social␣behaviour'
GO

-- This had to be done with the [Crime ID] to ensure the DISTINCT was
   only removing the duplicates.
-- A new table was created without the [Crime ID]
SELECT
     [Date]
     ,[Police Force]
     ,[Longitude]
     ,[Latitude]
     ,[LSOA Code]
     ,[LSOA name]
     ,[Crime]
     ,[Outcome]
INTO [Staged].[Crime Data]
```

```
  FROM [Staged].[Crime Data with Original Crime ID]
GO
-- The final stage is to add an identity column
ALTER TABLE Staged.[Crime Data]
ADD [Crime ID] INT identity primary key

-- LSOA Population

SELECT
          CAST([F2] as VARCHAR(9)) [LAD Code]
     ,CAST([F21] as INT) [Population 2014]
     ,CAST([F22] as INT) [Population 2015]
     ,CAST([F23] as INT) [Population 2016]
INTO Staged.[Population]
  FROM [dbo].[Population]
WHERE substring([F2],1,1) not in ('K','S','N','W')
 and [F2] is not null
 and [F2] != 'LAU1 code'

GO

-- LAD Conversion

SELECT
     CAST([Local Authority] as VARCHAR(50)) [Local Authority District]
     ,CAST([Region] as VARCHAR(50)) [Region]
     ,CAST([Police force area] as VARCHAR(50)) [Police Force Area]
INTO Staged.[LAD Conversion]
  FROM [dbo].[LAD to Force]
GO

-- Knife Crime London

SELECT CAST([F1] as VARCHAR (50)) [London Borough]
     ,CAST([2016/17] as INT) [2016/2017 Knife Crime]
     ,CAST([F4] as INT)[2016/2017 Knife Crime with Injury]
     ,CAST([2017/18] as INT)[2017/2018 Knife Crime]
     ,CAST([F7] as INT)[2017/2018 Knife Crime with Injury]
INTO Staged.[Knife Crime London]
  FROM [dbo].[Knife Crime London]
  WHERE [2016/17] is not null

-- Knife Crime England

SELECT CAST([F1] as VARCHAR(50)) [Police Region]
     ,CAST([2013/14] as INT) [2013/2014 Knife Crime]
```

```
      ,CAST(ISNULL([F13],'␣') as INT)[2013/2014 Knife Crime(per 100,000
         population)]
      ,CAST([2014/15] as INT)[2014/2015 Knife Crime]
      ,CAST(ISNULL([F15],'␣') as INT)[2014/2015 Knife Crime(per 100,000
         population)]
      ,CAST([2015/16] as INT)[2015/2016 Knife Crime]
      ,CAST(ISNULL([F17],'␣') as INT)[2015/2016 Knife Crime(per 100,000
         population)]
      ,CAST([2016/17] as INT)[2016/2017 Knife Crime]
      ,CAST(ISNULL([F19],'␣') as INT)[2016/2017 Knife Crime(per 100,000
         population)]
      ,CAST([2017/18] as INT)[2017/2018 Knife Crime]
      ,CAST(ISNULL([F21],'␣') as INT)[2017/2018 Knife Crime(per 100,000
         population)]
INTO Staged.[Knife Crime Country]
  FROM [dbo].[Knife Crime Country]
  WHERE [F1] not in(
  'British␣Transport␣Police','ENGLAND␣AND␣WALES4,5,6,7,8','Dyfed-Powys','
     Gwent','North␣Wales','South␣Wales','WALES','North␣East␣Region','
     North␣West␣Region','Yorkshire␣and␣the␣Humber␣Region','East␣Midlands␣
     Region','West␣Midlands␣Region','East␣of␣England␣Region','London','
     South␣East␣Region','South␣West␣Region')
  and [F1] is not null
```

Listing 24: Model Cleaning Appendix

B Model Enrichment and Building

```
USE [Crime]
GO

-- Crime Data FACT

 SELECT [Date]
         ,CAST(CASE [Police Force]
                WHEN 'Avon␣and␣Somerset␣Constabulary' THEN 1
                     WHEN 'Bedfordshire␣Police' THEN 2
                     WHEN 'Cambridgeshire␣Constabulary' THEN 3
                     WHEN 'Cheshire␣Constabulary'THEN 4
                     WHEN 'City␣of␣London␣Police' THEN 5
                     WHEN 'Cleveland␣Police' THEN 6
                     WHEN 'Cumbria␣Constabulary' THEN 7
                     WHEN 'Derbyshire␣Constabulary' THEN 8
                     WHEN 'Devon␣&␣Cornwall␣Police' THEN 9
                     WHEN 'Dorset␣Police' THEN 10
```

```
                WHEN 'Durham␣Constabulary' THEN 11
                WHEN 'Essex␣Police' THEN 12
                WHEN 'Gloucestershire␣Constabulary' THEN 13
                WHEN 'Greater␣Manchester␣Police' THEN 14
                WHEN 'Hampshire␣Constabulary' THEN 15
                WHEN 'Hertfordshire␣Constabulary' THEN 16
                WHEN 'Humberside␣Police' THEN 17
                WHEN 'Kent␣Police' THEN 18
                WHEN 'Lancashire␣Constabulary' THEN 19
                WHEN 'Leicestershire␣Police' THEN 20
                WHEN 'Lincolnshire␣Police' THEN 21
                WHEN 'Merseyside␣Police' THEN 22
                WHEN 'Metropolitan␣Police␣Service' THEN 23
                WHEN 'Norfolk␣Constabulary' THEN 24
                WHEN 'North␣Yorkshire␣Police' THEN 25
                WHEN 'Northamptonshire␣Police' THEN 26
                WHEN 'Northumbria␣Police' THEN 27
                WHEN 'Nottinghamshire␣Police' THEN 28
                WHEN 'South␣Yorkshire␣Police' THEN 29
                WHEN 'Staffordshire␣Police' THEN 30
                WHEN 'Suffolk␣Constabulary' THEN 31
                WHEN 'Surrey␣Police' THEN 32
                WHEN 'Sussex␣Police' THEN 33
                WHEN 'Thames␣Valley␣Police' THEN 34
                WHEN 'Warwickshire␣Police' THEN 35
                WHEN 'West␣Mercia␣Police' THEN 36
                WHEN 'West␣Midlands␣Police' THEN 37
                WHEN 'West␣Yorkshire␣Police' THEN 38
                WHEN 'Wiltshire␣Police' THEN 39
        END as INT) [Police ID]
,[Longitude]
,[Latitude]
,[LSOA Code]
   ,CAST(CASE [Crime]
                WHEN 'Anti-social␣behaviour' THEN 1
                WHEN'Burglary' THEN 2
                WHEN 'Vehicle␣crime' THEN 3
                WHEN 'Violence␣and␣sexual␣offences' THEN 4
                WHEN 'Criminal␣damage␣and␣arson' THEN 5
                WHEN 'Other␣theft' THEN 6
                WHEN 'Public␣order' THEN 7
                WHEN 'Bicycle␣theft' THEN 8
                WHEN 'Drugs' THEN 9
                WHEN 'Theft␣FROM␣the␣person' THEN 10
                WHEN 'Other␣crime' THEN 11
                WHEN 'Shoplifting' THEN 12
```

```
                    WHEN 'Robbery' THEN 13
                    WHEN 'Possession␣of␣weapons' THEN 14
               END as INT) [Crime Type ID]
          ,CAST (CASE [Outcome]
                WHEN 'Offender␣given␣community␣sentence' THEN 1
                    WHEN 'Offender␣given␣conditional␣discharge' THEN 2
                    WHEN 'Offender␣given␣suspended␣prison␣sentence'
                       THEN 3
                    WHEN 'Offender␣given␣a␣caution' THEN 4
                    WHEN 'Formal␣action␣is␣not␣in␣the␣public␣interest'
                       THEN 5
                    WHEN 'Suspect␣charged␣as␣part␣of␣another␣CASE' THEN
                        6
                    WHEN 'Local␣resolution' THEN 7
                    WHEN 'Offender␣sent␣to␣prison' THEN 8
                    WHEN 'Offender␣given␣a␣drugs␣possession␣warning'
                       THEN 9
                    WHEN 'Action␣to␣be␣taken␣by␣another␣organisation'
                       THEN 10
                    WHEN 'Offender␣given␣penalty␣notice' THEN 11
                    WHEN 'Offender␣otherwise␣dealt␣with' THEN 12
                    WHEN 'Offender␣fined' THEN 13
                    WHEN 'Offender␣ordered␣to␣pay␣compensation' THEN 14
                    WHEN 'Offender␣given␣absolute␣discharge' THEN 15
                    WHEN 'Offender␣deprived␣of␣property' THEN 16
               END as INT) [Outcome ID]
      ,[Crime ID]
INTO Model.[Crime Data]
  FROM [Staged].[Crime Data]
GO

-- Date DIMENSION

SELECT DISTINCT
       [Date]
  , DATEPART(YEAR,[Date]) [Year]
  , DATEPART(MONTH,[Date]) [Month]
  , DATEPART(QUARTER,[Date]) AS [Quarter]
  , DATEPART(QUARTER,DATEADD(MONTH,3,[Date])) AS [Finacial Quarter]
  , YEAR(DATEADD(MONTH,3,[Date])-1) AS [Financial Year]
INTO Model.[Date Data]
  FROM [Model].[Crime Data]
GO

-- Police Force Data DIMENSION
```

```
SELECT DISTINCT
      [Police ID]
         ,CASE [Police ID]
                WHEN 1 THEN'Avon and Somerset Constabulary'
                      WHEN 2 THEN 'Bedfordshire Police'
                      WHEN 3 THEN 'Cambridgeshire Constabulary'
                      WHEN 4 THEN 'Cheshire Constabulary'
                      WHEN 5 THEN 'City of London Police'
                      WHEN 6 THEN 'Cleveland Police'
                      WHEN 7 THEN 'Cumbria Constabulary'
                      WHEN 8 THEN 'Derbyshire Constabulary'
                      WHEN 9 THEN 'Devon & Cornwall Police'
                      WHEN 10 THEN 'Dorset Police'
                      WHEN 11 THEN 'Durham Constabulary'
                      WHEN 12 THEN 'Essex Police'
                      WHEN 13 THEN 'Gloucestershire Constabulary'
                      WHEN 14 THEN 'Greater Manchester Police'
                      WHEN 15 THEN 'Hampshire Constabulary'
                      WHEN 16 THEN 'Hertfordshire Constabulary'
                      WHEN 17 THEN 'Humberside Police'
                      WHEN 18 THEN 'Kent Police'
                      WHEN 19 THEN 'Lancashire Constabulary'
                      WHEN 20 THEN 'Leicestershire Police'
                      WHEN 21 THEN 'Lincolnshire Police'
                      WHEN 22 THEN 'Merseyside Police'
                      WHEN 23 THEN 'Metropolitan Police Service'
                      WHEN 24 THEN 'Norfolk Constabulary'
                      WHEN 25 THEN 'North Yorkshire Police'
                      WHEN 26 THEN 'Northamptonshire Police'
                      WHEN 27 THEN 'Northumbria Police'
                      WHEN 28 THEN 'Nottinghamshire Police'
                      WHEN 29 THEN 'South Yorkshire Police'
                      WHEN 30 THEN 'Staffordshire Police'
                      WHEN 31 THEN 'Suffolk Constabulary'
                      WHEN 32 THEN 'Surrey Police'
                      WHEN 33 THEN 'Sussex Police'
                      WHEN 34 THEN 'Thames Valley Police'
                      WHEN 35 THEN 'Warwickshire Police'
                      WHEN 36 THEN 'West Mercia Police'
                      WHEN 37 THEN 'West Midlands Police'
                      WHEN 38 THEN 'West Yorkshire Police'
                      WHEN 39 THEN 'Wiltshire Police'
                ELSE 'N/A'
                END as [Police Force]
                ,CASE
                   WHEN [Police ID] in(18,32,33) THEN 'South East'
```

```
        WHEN [Police ID] in(2,16,34) THEN 'Thames & Chiltern'
        WHEN [Police ID] in(1,9,13) THEN 'South West'
        WHEN [Police ID] in(10,15,39) THEN 'Wessex'
        WHEN [Police ID] in(30,35,36,37) THEN 'West Midlands'
        WHEN [Police ID] in(8,20,21,26,28) THEN 'East Midlands'
        WHEN [Police ID] in(3,12,31,24) THEN 'Easternn'
        WHEN [Police ID] in(22,4) THEN 'Merseyside & Chesire '
        WHEN [Police ID] in(17,38,29,25) THEN 'Yorkshire and
           Humberside'
        WHEN [Police ID] in(7,14,19) THEN 'Greater Manchester,
           Lancashire & Cumbria'
        WHEN [Police ID] in(6,11,27) THEN 'North East'
        WHEN [Police ID] in(23,5) THEN 'London'
ELSE 'N/A'
     END as [Region]
     ,CASE [Police ID]
      WHEN 1 THEN'Avon and Somerset'
            WHEN 2 THEN 'Bedfordshire'
            WHEN 3 THEN 'Cambridgeshire'
            WHEN 4 THEN 'Cheshire'
            WHEN 5 THEN 'City of London'
            WHEN 6 THEN 'Cleveland'
            WHEN 7 THEN 'Cumbria'
            WHEN 8 THEN 'Derbyshire'
            WHEN 9 THEN 'Devon and Cornwall'
            WHEN 10 THEN 'Dorset'
            WHEN 11 THEN 'Durham'
            WHEN 12 THEN 'Essex'
            WHEN 13 THEN 'Gloucestershire'
            WHEN 14 THEN 'Greater Manchester'
            WHEN 15 THEN 'Hampshire'
            WHEN 16 THEN 'Hertfordshire'
            WHEN 17 THEN 'Humberside'
            WHEN 18 THEN 'Kent'
            WHEN 19 THEN 'Lancashire'
            WHEN 20 THEN 'Leicestershire'
            WHEN 21 THEN 'Lincolnshire'
            WHEN 22 THEN 'Merseyside'
            WHEN 23 THEN 'Metropolitan Police'
            WHEN 24 THEN 'Norfolk'
            WHEN 25 THEN 'North Yorkshire'
            WHEN 26 THEN 'Northamptonshire'
            WHEN 27 THEN 'Northumberland'
            WHEN 28 THEN 'Nottinghamshire'
            WHEN 29 THEN 'South Yorkshire'
            WHEN 30 THEN 'Staffordshire'
```

```
        WHEN 31 THEN 'Suffolk'
        WHEN 32 THEN 'Surrey'
        WHEN 33 THEN 'Sussex'
        WHEN 34 THEN 'Thames␣Valley␣'
        WHEN 35 THEN 'Warwickshire'
        WHEN 36 THEN 'West␣Mercia'
        WHEN 37 THEN 'West␣Midlands'
        WHEN 38 THEN 'West␣Yorkshire'
        WHEN 39 THEN 'Wiltshire'
ELSE 'N/A'
END as [County]
,CAST(CASE
   WHEN [Police ID] in(31) THEN 3
   WHEN [Police ID] in(9,11,7) THEN 4
   WHEN [Police ID] in(26) THEN 7
   WHEN [Police ID] in(13,27) THEN 9
   WHEN [Police ID] in(25,4,39) THEN 12
   WHEN [Police ID] in(15) THEN 15
   WHEN [Police ID] in(18,37,20,22,32) THEN 16
   WHEN [Police ID] in(5,2,36,19) THEN 21
   WHEN [Police ID] in(24,12,8) THEN 25
   WHEN [Police ID] in(10,21,29) THEN 28
   WHEN [Police ID] in(3,16) THEN 31
   WHEN [Police ID] in(33,30,38) THEN 33
   WHEN [Police ID] in(1,34,35,14) THEN 36
   WHEN [Police ID] in(6,17) THEN 40
   WHEN [Police ID] in(28) THEN 42
   WHEN [Police ID] in(23) THEN 43
END as TINYNT) [Detection Ranking (incl. Wales)]
       ,CAST(CASE
   WHEN [Police ID] in(31) THEN 35
   WHEN [Police ID] in(9,11,7) THEN 34
   WHEN [Police ID] in(26) THEN 33
   WHEN [Police ID] in(13,27) THEN 31
   WHEN [Police ID] in(25,4,39) THEN 30
   WHEN [Police ID] in(15) THEN 29
   WHEN [Police ID] in(18,37,20,22,32) THEN 28
   WHEN [Police ID] in(5,2,36,19) THEN 27
   WHEN [Police ID] in(24,12,8) THEN 26
   WHEN [Police ID] in(10,21,29) THEN 25
   WHEN [Police ID] in(3,16) THEN 24
   WHEN [Police ID] in(33,30,38) THEN 23
   WHEN [Police ID] in(1,34,35,14) THEN 22
   WHEN [Police ID] in(6,17) THEN 21
   WHEN [Police ID] in(28) THEN 20
   WHEN [Police ID] in(23) THEN 15
```

```
            END as TINYNT)[% of Recorderd Crimes Detected]
INTO Model.[Police Force Data]
  FROM [Model].[Crime Data]
WHERE [Police ID] is not null
order by [Police ID] asc

-- Crime Type DIMENSION

SELECT DISTINCT
     [Crime Type ID]
        ,CASE [Crime Type ID]
                    WHEN 1 THEN 'Anti-social behaviour'
                    WHEN 2 THEN 'Burglary'
                    WHEN 3 THEN 'Vehicle crime'
                    WHEN 4 THEN 'Violence and sexual offences'
                    WHEN 5 THEN 'Criminal damage and arson'
                    WHEN 6 THEN 'Other theft'
                    WHEN 7 THEN 'Public order'
                    WHEN 8 THEN 'Bicycle theft'
                    WHEN 9 THEN 'Drugs'
                    WHEN 10 THEN 'Theft FROM the person'
                    WHEN 11 THEN 'Other crime'
                    WHEN 12 THEN 'Shoplifting'
                    WHEN 13 THEN 'Robbery'
                    WHEN 14 THEN 'Possession of weapons'
              END as [Crime Type]
              ,CAST(CASE
                    WHEN [Crime Type ID] in(1,4) THEN 1
                    WHEN [Crime Type ID] in(2,3,5,6,8,10,12,13) THEN 2
                    WHEN [Crime Type ID] in(7) THEN 3
                    WHEN [Crime Type ID] in(9,14) THEN 4
                    WHEN [Crime Type ID] in(11) THEN 5
              END as INT)[Crime Category ID]
              ,CAST(CASE
                    WHEN [Crime Type ID] in(1,8,10,12) THEN 1
                    ELSE 2
              END as INT) [Felony/Misdemeanor ID]
              ,CAST(CASE
                    WHEN [Crime Type ID] in(7,9,14) THEN 1
                    ELSE 2
              END as INT) [Victim/Victimless ID]
              ,CAST(CASE
                    WHEN [Crime Type ID] in(12,8) THEN 1
                    WHEN [Crime Type ID] in(1,6,7,10) THEN 2
                    WHEN [Crime Type ID] in(3,11) THEN 3
                    WHEN [Crime Type ID] in(13,2) THEN 4
```

```
                    WHEN [Crime Type ID] in(4,5,9,14) THEN 5
              END as TINYNT) [5 Scale Severity Rating]
INTO Model.[Crime Type Data]
  FROM [Model].[Crime Data]
GO

-- Crime Category LOOKUP

SELECT DISTINCT
        CAST(CASE
                    WHEN [Crime Type ID] in(1,4) THEN 1
                    WHEN [Crime Type ID] in(2,3,5,6,8,10,12,13) THEN 2
                    WHEN [Crime Type ID] in(7) THEN 3
                    WHEN [Crime Type ID] in(9,14) THEN 4
                    WHEN [Crime Type ID] in(11) THEN 5
              END as INT)[Crime Category ID]
              ,CASE
                    WHEN [Crime Type ID] in(1,4) THEN 'Violent␣Crime'
                    WHEN [Crime Type ID] in(2,3,5,6,8,10,12,13) THEN '
                       Property␣Crime'
                    WHEN [Crime Type ID] in(7) THEN 'Political␣Crime'
                    WHEN [Crime Type ID] in(9,14) THEN 'Possession␣
                       Crime'
                    WHEN [Crime Type ID] in(11) THEN 'Other␣Crime'
              END [Crime Category]
INTO Model.[Crime Category Data]
  FROM [Model].[Crime Data]

-- Felony/Misdemeanor LOOKUP

SELECT DISTINCT
              CASE
                    WHEN [Crime Type ID] in(1,8,10,12) THEN '
                       Misdemeanor'
                    ELSE 'Felony'
              END [Felony/Misdemeanor]
              ,CAST(CASE
                    WHEN [Crime Type ID] in(1,8,10,12) THEN 1
                    ELSE 2
              END as INT) [Felony/Misdemeanor ID]
INTO Model.[Felony/Misdemeanor Data]
FROM [Model].[Crime Data]

-- Victim/Victimless Data LOOKUP

SELECT DISTINCT
```

```
                    CASE
                    WHEN [Crime Type ID] in(7,9,14) THEN 'Victimless'
                    ELSE 'Victim'
                END as [Victim/Victimless]
                ,CAST(CASE
                    WHEN [Crime Type ID] in(7,9,14) THEN 1
                    ELSE 2
                END as INT) [Victim/Victimless ID]
INTO Model.[Victim/Victimless Data]
FROM [Model].[Crime Data]

-- Outcome Type Data DIMENSION

SELECT DISTINCT
      [Outcome ID]
          ,CASE [Outcome ID]
                    WHEN 1 THEN 'Offender given community sentence'
                    WHEN 2 THEN 'Offender given conditional discharge'
                    WHEN 3 THEN 'Offender given suspended prison
                       sentence'
                    WHEN 4 THEN 'Offender given a caution'
                    WHEN 5 THEN 'Formal action is not in the public
                       interest'
                    WHEN 6 THEN 'Suspect charged as part of another
                       CASE'
                    WHEN 7 THEN 'Local resolution'
                    WHEN 8 THEN 'Offender sent to prison'
                    WHEN 9 THEN 'Offender given a drugs possession
                       warning'
                    WHEN 10 THEN 'Action to be taken by another
                       organisation'
                    WHEN 11 THEN 'Offender given penalty notice'
                    WHEN 12 THEN 'Offender otherwise dealt with'
                    WHEN 13 THEN 'Offender fined'
                    WHEN 14 THEN 'Offender ordered to pay compensation'
                    WHEN 15 THEN 'Offender given absolute discharge'
                    WHEN 16 THEN 'Offender deprived of property'
                END as [Outcome Type]
                ,CASE
                    WHEN [Outcome ID] in(5,6,7,10,12) THEN 'False'
                    ELSE 'True'
                END as [CASE Resolved Inclusively]
                ,CAST(CASE
                    WHEN [Outcome ID] in(2,5,15) THEN 1
                    WHEN [Outcome ID] in(4) THEN 2
                    WHEN [Outcome ID] in(1,9,11,13,14) THEN 3
```

```
                    WHEN [Outcome ID] in(16) THEN 4
                    WHEN [Outcome ID] in(3,8) THEN 5
                    ELSE 0
                END as INT) [5 Scale Severity Rating]
INTO Model.[Outcome Type Data]
FROM [Model].[Crime Data]
WHERE [Outcome ID] is not null

-- Geography DIMENSION

SELECT DISTINCT
     CD.[LSOA Code]
     ,CD.[LSOA Name]
         ,REVERSE(SUBSTRING(REVERSE(CD.[LSOA Name]),5,50)) [Local
            Authority District Name]
         ,SUBSTRING(CD.[LSOA Code],2,2) [SOA Layer]
         ,SUBSTRING(CD.[LSOA Code],4,6) [Unique Area Tag]
         ,SUBSTRING((REVERSE(CD.[LSOA Name])),1,1) [MSOA Indeitfication]
         ,REVERSE(SUBSTRING((REVERSE(CD.[LSOA Name])),2,3)) [Middle SOA
            Label]
INTO Model.[Geo without Police Force]
  FROM [Staged].[Crime Data] CD

SELECT
               [LSOA Code]
     ,[LSOA Name]
     ,REPLACE(REPLACE([Local Authority District Name],'␣and␣','␣&␣'),'
        London␣City␣of','City␣of␣London') [Local Authority District]
     ,[SOA Layer]
     ,[Unique Area Tag]
     ,[MSOA Identification]
     ,[Middle SOA Label]
INTO [Model].[Geo without Police Correct]
  FROM [Model].[Geo without Police Force]

SELECT REPLACE(REPLACE([Local Authority District],'␣and␣','␣&␣'),'London␣
   City␣of','City␣of␣London') [Local Authority District]
     ,[Region]
     ,REPLACE([Police Force Area],'London␣City␣of','City␣of␣London') [
        Police Force Area]
INTO Model.[Lad Conversion]
  FROM [Staged].[LAD Conversion]


  SELECT DISTINCT
               GP.[LSOA Code]
```

```
      ,GP.[LSOA Name]
      ,GP.[SOA Layer]
      ,GP.[Unique Area Tag]
      ,GP.[MSOA Indeitfication]
      ,GP.[Middle SOA Label]
          ,LC.[Region]
          ,CASE GP.[Local Authority District]
                WHEN 'Barking & Dagenham' THEN 1
                WHEN 'Barnet'    THEN 2
                WHEN 'Bexley'    THEN 3
                WHEN 'Brent'    THEN 4
                WHEN 'Bromley'    THEN 5
                WHEN 'Camden'    THEN 6
                WHEN 'Croydon'    THEN 7
                WHEN 'Ealing'    THEN 8
                WHEN 'Enfield'   THEN 9
                WHEN 'Greenwich'    THEN 10
                WHEN 'Hackney'   THEN 11
                WHEN 'Hammersmith & Fulham' THEN 12
                WHEN 'Haringey'    THEN 13
                WHEN 'Harrow'    THEN 14
                WHEN 'Havering'    THEN 15
                WHEN 'Hillingdon'   THEN 16
                WHEN 'Hounslow'    THEN 17
                WHEN 'Islington'    THEN 18
                WHEN 'Kensington & ChELSEa' THEN 19
                WHEN 'Kingston upon Thames' THEN 20
                WHEN 'Lambeth'    THEN 21
                WHEN 'Lewisham'    THEN 22
                WHEN 'Merton'    THEN 23
                WHEN 'Newham'    THEN 24
                WHEN 'Redbridge'    THEN 25
                WHEN 'Richmond upon Thames' THEN 26
                WHEN 'Southwark'    THEN 27
                WHEN 'Sutton'    THEN 28
                WHEN 'Tower Hamlets'   THEN 29
                WHEN 'Waltham Forest'  THEN 30
                WHEN 'Wandsworth'   THEN 31
                WHEN 'Westminster'   THEN 32
                ELSE ' '
END as [Local Authority District ID]

,CASE LC.[Police Force Area]
                WHEN 'Avon & Somerset' THEN 1
                WHEN 'Bedfordshire' THEN 2
                WHEN 'Cambridgeshire' THEN 3
```

```
                WHEN 'Cheshire' THEN 4
                WHEN 'City␣of␣London' THEN 5
                WHEN 'Cleveland' THEN 6
                WHEN 'Cumbria' THEN 7
                WHEN 'Derbyshire' THEN 8
                WHEN 'Devon␣&␣Cornwall' THEN 9
                WHEN 'Dorset' THEN 10
                WHEN 'Durham' THEN 11
                WHEN 'Essex' THEN 12
                WHEN 'Gloucestershire' THEN 13
                WHEN 'Greater␣Manchester' THEN 14
                WHEN 'Hampshire' THEN 15
                WHEN 'Hertfordshire' THEN 16
                WHEN 'Humberside' THEN 17
                WHEN 'Kent' THEN 18
                WHEN 'Lancashire' THEN 19
                WHEN 'Leicestershire' THEN 20
                WHEN 'Lincolnshire' THEN 21
                WHEN 'Merseyside' THEN 22
                WHEN 'Metropolitan␣Police' THEN 23
                WHEN 'Norfolk' THEN 24
                WHEN 'North␣Yorkshire' THEN 25
                WHEN 'Northamptonshire' THEN 26
                WHEN 'Northumbria' THEN 27
                WHEN 'Nottinghamshire' THEN 28
                WHEN 'South␣Yorkshire' THEN 29
                WHEN 'Staffordshire' THEN 30
                WHEN 'Suffolk' THEN 31
                WHEN 'Surrey' THEN 32
                WHEN 'Sussex' THEN 33
                WHEN 'Thames␣Valley' THEN 34
                WHEN 'Warwickshire' THEN 35
                WHEN 'West␣Mercia' THEN 36
                WHEN 'West␣Midlands' THEN 37
                WHEN 'West␣Yorkshire' THEN 38
                WHEN 'Wiltshire' THEN 39
END as [Police Force Area ID]
INTO Model.[Geography Data]
  FROM [Model].[Geo without Police Correct] GP
  INNER JOIN [Model].[Lad Conversion] LC
on GP.[Local Authority District]=LC.[Local Authority District]

-- Knife Crime London FACT

SELECT REPLACE([London Borough],'␣and␣','␣&␣') [London Borough]
     ,[2016/2017 Knife Crime]
```

```
      ,[2016/2017 Knife Crime with Injury]
      ,[2017/2018 Knife Crime]
      ,[2017/2018 Knife Crime with Injury]
INTO Model.[Knife Crime London]
  FROM [Staged].[Knife Crime London]
WHERE [London Borough] != 'Grand␣Total'
GO

SELECT DISTINCT
      GD.[Local Authority District ID]
          ,KC.[2016/2017 Knife Crime] [Knife Crime]
      ,KC.[2016/2017 Knife Crime with Injury] [Knife Crime with Injury]
INTO Model.[London Knife Crime 2016/2017]
  FROM [Model].[Geography Data] GD
INNER JOIN Model.[Knife Crime London] KC
on GD.[Local Authority District]=KC.[London Borough]

SELECT
*
FROM Model.[London Knife Crime 2016/2017]

Alter table Model.[London Knife Crime 2016/2017]
Add [Year] int
UPDATE Model.[London Knife Crime 2016/2017]
SET [Year] = 2016

SELECT
*
FROM Model.[London Knife Crime 2016/2017]

SELECT DISTINCT
      GD.[Local Authority District ID ]
          ,KC.[2017/2018 Knife Crime] [Knife Crime]
      ,KC.[2017/2018 Knife Crime with Injury] [Knife Crime with Injury]
INTO Model.[London Knife Crime 2017/2018]
  FROM [Model].[Geography Data] GD
INNER JOIN [Model].[Knife Crime London] KC
on GD.[Local Authority District]=KC.[London Borough]

Alter table Model.[London Knife Crime 2017/2018]
Add [Year] int
UPDATE Model.[London Knife Crime 2017/2018]
SET [Year] = 2017


SELECT *
```

```
INTO [Model].[Knife Crime London Data]
FROM
(
SELECT *
FROM Model.[London Knife Crime 2017/2018]
UNION
SELECT *
FROM Model.[London Knife Crime 2016/2017]
)a

--Knife Crime England FACT

SELECT REPLACE(REPLACE([Police Region],' and ',' & '),'Northumberland','
   Northumbria') [Police Force Area]
      ,[2013/2014 Knife Crime]
      ,[2013/2014 Knife Crime(per 100,000 population)]
      ,[2014/2015 Knife Crime]
      ,[2014/2015 Knife Crime(per 100,000 population)]
      ,[2015/2016 Knife Crime]
      ,[2015/2016 Knife Crime(per 100,000 population)]
      ,[2016/2017 Knife Crime]
      ,[2016/2017 Knife Crime(per 100,000 population)]
      ,[2017/2018 Knife Crime]
      ,[2017/2018 Knife Crime(per 100,000 population)]
INTO [Model].[Knife Crime Country]
  FROM [Staged].[Knife Crime Country]


SELECT DISTINCT
   GD.[Police Force Area ID]
         ,KC.[2013/2014 Knife Crime][Knife Crime]
      ,KC.[2013/2014 Knife Crime(per 100,000 population)] [Knife Crime(per
          100,000 population)]
INTO Model.[National Knife Crime 2013/2014 Data]
  FROM Model.[Geography Data] GD
JOIN [model].[Knife Crime Country] KC
on GD.[Police Force Area]=KC.[Police Force Area]

GO

Alter table Model.[National Knife Crime 2013/2014 Data]
Add [Financial Year] int
UPDATE Model.[National Knife Crime 2013/2014 Data]
SET [Financial Year] = 2013

SELECT
```

```
*
FROM Model.[National Knife Crime 2013/2014 Data]

SELECT DISTINCT
               GD.[Police Force Area ID]
         ,KC.[2014/2015 Knife Crime] [Knife Crime]
     ,KC.[2014/2015 Knife Crime(per 100,000 population)][Knife Crime(per
        100,000 population)]
INTO Model.[National Knife Crime 2014/2015 Data]
  FROM Model.[Geography Data] GD
JOIN [Model].[Knife Crime Country] KC
on GD.[Police Force Area]=KC.[Police Force Area]
GO

Alter table Model.[National Knife Crime 2014/2015 Data]
Add [Financial Year] int
UPDATE Model.[National Knife Crime 2014/2015 Data]
SET [Financial Year] = 2014


SELECT DISTINCT
               GD.[Police Force Area ID]
         ,KC.[2015/2016 Knife Crime] [Knife Crime]
     ,KC.[2015/2016 Knife Crime(per 100,000 population)][Knife Crime(per
        100,000 population)]
INTO Model.[National Knife Crime 2015/2016 Data]
  FROM Model.[Geography Data] GD
JOIN [model].[Knife Crime Country] KC
on GD.[Police Force Area]=KC.[Police Force Area]
GO

Alter table Model.[National Knife Crime 2015/2016 Data]
Add [Financial Year] int
UPDATE Model.[National Knife Crime 2015/2016 Data]
SET [Financial Year] = 2015


SELECT DISTINCT
              GD.[Police Force Area ID]
         ,KC.[2016/2017 Knife Crime] [Knife Crime]
     ,KC.[2016/2017 Knife Crime(per 100,000 population)][Knife Crime(per
        100,000 population)]
INTO Model.[National Knife Crime 2016/2017 Data]
  FROM Model.[Geography Data] GD
JOIN [model].[Knife Crime Country] KC
on GD.[Police Force Area]=KC.[Police Force Area]
```

```
GO

Alter table Model.[National Knife Crime 2016/2017 Data]
Add [Financial Year] int
UPDATE Model.[National Knife Crime 2016/2017 Data]
SET [Financial Year] = 2016


SELECT DISTINCT
              GD.[Police Force Area ID]
         ,KC.[2017/2018 Knife Crime] [Knife Crime]
     ,KC.[2017/2018 Knife Crime(per 100,000 population)][Knife Crime(per
        100,000 population)]
INTO Model.[National Knife Crime 2017/2018 Data]
  FROM Model.[Geography Data] GD
JOIN [model].[Knife Crime Country] KC
on GD.[Police Force Area]=KC.[Police Force Area]
GO

Alter table Model.[National Knife Crime 2017/2018 Data]
Add [Financial Year] int
UPDATE Model.[National Knife Crime 2017/2018 Data]
SET [Financial Year] = 2017

SELECT *
INTO [Model].[Knife Crime Country Data]
FROM
(
SELECT *
FROM Model.[National Knife Crime 2017/2018 Data]
UNION
SELECT *
FROM Model.[National Knife Crime 2016/2017 Data]
UNION
SELECT *
FROM Model.[National Knife Crime 2015/2016 Data]
UNION
SELECT *
FROM Model.[National Knife Crime 2014/2015 Data]
)a


-- Population Data DIMENSION

SELECT
       GD.[LSOA Code]
```

```
       ,PD.[Population 2017] [Population]
INTO Model.[Population 2017]
  FROM [Staged].[LSOA Population] PD
INNER JOIN Model.[Geography Data] GD
on PD.[LSOA Code]=GD.[LSOA Code]


Alter table Model.[Population 2017]
Add [Year] int
UPDATE Model.[Population 2017]
SET [Year] = 2017

SELECT
       GD.[LSOA Code]
       ,PD.[Population 2016] [Population]
INTO Model.[Population 2016]
  FROM [Staged].[LSOA Population] PD
INNER JOIN Model.[Geography Data] GD
on PD.[LSOA Code]=GD.[LSOA Code]

Alter table Model.[Population 2016]
Add [Year] int
UPDATE Model.[Population 2016]
SET [Year] = 2016

 SELECT
       GD.[LSOA Code]
       ,PD.[Population 2015] [Population]
INTO Model.[Population 2015]
  FROM [Staged].[LSOA Population] PD
INNER JOIN Model.[Geography Data] GD
on PD.[LSOA Code]=GD.[LSOA Code]

Alter table Model.[Population 2015]
Add [Year] int
UPDATE Model.[Population 2015]
SET [Year] = 2015

SELECT
       GD.[LSOA Code]
       ,PD.[Population 2014] [Population]
INTO Model.[Population 2014]
  FROM [Staged].[LSOA Population] PD
INNER JOIN Model.[Geography Data] GD
on PD.[LSOA Code]=GD.[LSOA Code]
```

```
Alter table Model.[Population 2014]
Add [Year] int
UPDATE Model.[Population 2014]
SET [Year] = 2014


SELECT
*
INTO Model.[Population Data]
FROM (
SELECT *
FROM Model.[Population 2017]
UNION
SELECT *
FROM Model.[Population 2016]
UNION
SELECT *
FROM Model.[Population 2015]
UNION
SELECT *
FROM Model.[Population 2014]
)a
```

Listing 25: Model Enrichment and Building Appendix

C Linking LOOKUP Tables

```
-- LOOKUP TABLE
-- Region Data LOOKUP

SELECT
REPLACE(REPLACE([Police Region],'␣and␣','␣&␣'),'Northumberland','
   Northumbria') [Police Force Area]
,CASE [Police Region]
              WHEN 'Avon␣and␣Somerset' THEN 1
              WHEN 'Bedfordshire'   THEN 2
              WHEN 'Cambridgeshire'  THEN 3
              WHEN 'Cheshire'    THEN 4
              WHEN 'City␣of␣London'  THEN 5
              WHEN 'Cleveland'   THEN 6
              WHEN 'Cumbria'    THEN 7
              WHEN 'Derbyshire'   THEN 8
              WHEN 'Devon␣and␣Cornwall' THEN 9
              WHEN 'Dorset'    THEN 10
              WHEN 'Durham'    THEN 11
```

```
                WHEN 'Essex'    THEN 12
                WHEN 'Gloucestershire'  THEN 13
                WHEN 'Greater␣Manchester' THEN 14
                WHEN 'Hampshire'   THEN 15
                WHEN 'Hertfordshire'  THEN 16
                WHEN 'Humberside'   THEN 17
                WHEN 'Kent'     THEN 18
                WHEN 'Lancashire'   THEN 19
                WHEN 'Leicestershire'  THEN 20
                WHEN 'Lincolnshire'   THEN 21
                WHEN 'Merseyside'   THEN 22
                WHEN 'Metropolitan␣Police' THEN 23
                WHEN 'Norfolk'    THEN 24
                WHEN 'North␣Yorkshire'  THEN 25
                WHEN 'Northamptonshire'  THEN 26
                WHEN 'Northumberland'  THEN 27
                WHEN 'Nottinghamshire'  THEN 28
                WHEN 'South␣Yorkshire'  THEN 29
                WHEN 'Staffordshire'  THEN 30
                WHEN 'Suffolk'    THEN 31
                WHEN 'Surrey'    THEN 32
                WHEN 'Sussex'    THEN 33
                WHEN 'Thames␣Valley'  THEN 34
                WHEN 'Warwickshire'   THEN 35
                WHEN 'West␣Mercia'   THEN 36
                WHEN 'West␣Midlands'  THEN 37
                WHEN 'West␣Yorkshire'  THEN 38
                WHEN 'Wiltshire'   THEN 39
end as [Police Force Area ID]
INTO model.[Region Data]
  FROM [Staged].[Knife Crime Country]

-- Local Authority District LOOKUP

SELECT
REPLACE([London Borough],'␣and␣','␣&␣') [Local Authority District]
,CASE [London Borough]
                WHEN 'Barking␣and␣Dagenham' THEN 1
                WHEN 'Barnet'    THEN 2
                WHEN 'Bexley'    THEN 3
                WHEN 'Brent'    THEN 4
                WHEN 'Bromley'    THEN 5
                WHEN 'Camden'    THEN 6
                WHEN 'Croydon'    THEN 7
                WHEN 'Ealing'    THEN 8
                WHEN 'Enfield'    THEN 9
```

```
                WHEN 'Greenwich'   THEN 10
                WHEN 'Hackney'    THEN 11
                WHEN 'Hammersmith␣and␣Fulham' THEN 12
                WHEN 'Haringey'    THEN 13
                WHEN 'Harrow'    THEN 14
                WHEN 'Havering'    THEN 15
                WHEN 'Hillingdon'   THEN 16
                WHEN 'Hounslow'    THEN 17
                WHEN 'Islington'   THEN 18
                WHEN 'Kensington␣and␣Chelsea' THEN 19
                WHEN 'Kingston␣upon␣Thames' THEN 20
                WHEN 'Lambeth'    THEN 21
                WHEN 'Lewisham'    THEN 22
                WHEN 'Merton'    THEN 23
                WHEN 'Newham'    THEN 24
                WHEN 'Redbridge'    THEN 25
                WHEN 'Richmond␣upon␣Thames' THEN 26
                WHEN 'Southwark'   THEN 27
                WHEN 'Sutton'    THEN 28
                WHEN 'Tower␣Hamlets'  THEN 29
                WHEN 'Waltham␣Forest'  THEN 30
                WHEN 'Wandsworth'   THEN 31
                WHEN 'Westminster'   THEN 32
                ELSE '␣'
end as [Local Authority District ID]
INTO Model.[Local Authority District]
  FROM [Staged].[Knife Crime London]
WHERE [London Borough] != 'Grand␣Total'

-- Financial Year

CREATE TABLE Model.[Financial Year LOOKUP] (
  [Financial Year]INT NOT NULL);

INSERT INTO Model.[Financial Year LOOKUP]
    ([Financial Year])
VALUES
    (2014),
    (2015),
    (2016),
        (2017),
        (2018);
```

Listing 26: Linking LOOKUP Tables Appendix

D Model Keys

```
USE CRIME
GO

-- Primary Key
-- Crime Data table

ALTER TABLE [Model].[Crime Data]
ALTER COLUMN [Crime ID] INT NOT NULL

ALTER TABLE [Model].[Crime Data]
ADD PRIMARY KEY ([Crime ID])

-- Police Force Data

ALTER TABLE [Model].[Police Force Data]
ALTER COLUMN [Police Force ID] INT NOT NULL

ALTER TABLE [Model].[Outcome Type Data]
ADD PRIMARY KEY ([Outcome ID])

-- Outcome Type Data

ALTER TABLE [Model].[Outcome Type Data]
ALTER COLUMN [Outcome ID] INT NOT NULL

ALTER TABLE [Model].[Outcome Type Data]
ADD PRIMARY KEY ([Outcome ID])

-- Crime Type Data

ALTER TABLE [Model].[Crime Type Data]
ALTER COLUMN [Crime Type ID] INT NOT NULL

ALTER TABLE [Model].[Crime Type Data]
ADD PRIMARY KEY ([Crime Type ID])

-- Felony Misdemeanor

ALTER TABLE [Model].[Felony/Misdemeanor Data]
ALTER COLUMN [Felony/Misdemeanor ID] INT NOT NULL

ALTER TABLE [Model].[Felony/Misdemeanor Data]
ADD PRIMARY KEY ([Felony/Misdemeanor ID])
```

```
-- Crime Category Data

ALTER TABLE [Model].[Crime Category Data]
ALTER COLUMN [Crime Category ID] INT NOT NULL

ALTER TABLE [Model].[Crime Category Data]
ADD PRIMARY KEY ([Crime Category ID])

-- Victim/Victimless Crime

ALTER TABLE [Model].[Victim/Victimless Data]
ALTER COLUMN [Victim/Victimless ID] INT NOT NULL

ALTER TABLE [Model].[Victim/Victimless Data]
ADD PRIMARY KEY ([Victim/Victimless ID])

-- Date Data

ALTER TABLE [Model].[Date Data]
ALTER COLUMN [Date] date NOT NULL

ALTER TABLE [Model].[Date Data]
ADD PRIMARY KEY ([Date])

--Geography Data

ALTER TABLE [Model].[Geography Data]
ALTER COLUMN [LSOA Code] varchar(9) NOT NULL

ALTER TABLE [Model].[Geography Data]
ADD PRIMARY KEY ([LSOA Code])

-- Local Authority District

ALTER TABLE [Model].[Local Authority District]
ALTER COLUMN [Local Authority District ID] INT NOT NULL

ALTER TABLE [Model].[Local Authority District]
ADD PRIMARY KEY ([Local Authority District ID])

-- Region Data

ALTER TABLE [Model].[Region Data]
ALTER COLUMN [Police Force Area ID] INT NOT NULL

ALTER TABLE [Model].[Region Data]
```

```
ADD PRIMARY KEY ([Police Force Area ID])

-- Financial Year

ALTER TABLE Model.[Financial Year LOOKUP]
ADD PRIMARY KEY ([Financial Year])

-- Foreign Key

ALTER TABLE [Model].[Crime Data]
ADD FOREIGN KEY([Date])
REFERENCES [Model].[Date Data] ([Date])

ALTER TABLE [Model].[Crime Data]
ALTER COLUMN [Police ID] INT

ALTER TABLE [Model].[Crime Data]
ADD FOREIGN KEY([Police ID])
REFERENCES [Model].[Police Force Data] ([Police ID])

ALTER TABLE [Model].[Crime Data]
ALTER COLUMN [Outcome ID] INT

ALTER TABLE [Model].[Crime Data]
ADD FOREIGN KEY([Outcome ID])
REFERENCES [Model].[Outcome Type Data] ([Outcome ID])

ALTER TABLE [Model].[Crime Type Data]
ALTER COLUMN [Crime Category ID] INT

ALTER TABLE [Model].[Crime Type Data]
ADD FOREIGN KEY([Crime Category ID])
REFERENCES [Model].[Crime Category Data] ([Crime Category ID])

ALTER TABLE [Model].[Crime Type Data]
ALTER COLUMN [Felony/Misdemeanor ID] INT

ALTER TABLE [Model].[Crime Type Data]
ADD FOREIGN KEY([Felony/Misdemeanor ID])
REFERENCES [Model].[Felony/Misdemeanor Data]([Felony/Misdemeanor ID])

ALTER TABLE [Model].[Crime Type Data]
ALTER COLUMN [Victim/Victimless ID] INT

ALTER TABLE [Model].[Crime Type Data]
ADD FOREIGN KEY([Victim/Victimless ID])
```

```
REFERENCES [Model].[Victim/Victimless Data]([Victim/Victimless ID])

ALTER TABLE [Model].[Crime Data] with nocheck
ADD FOREIGN KEY([LSOA Code])
REFERENCES [Model].[Geography Data]([LSOA Code])

ALTER TABLE [Model].[Population Data]
ADD FOREIGN KEY([LSOA Code])
REFERENCES [Model].[Geography Data]([LSOA Code])

ALTER TABLE [Model].[Knife Crime Country Data]
ADD FOREIGN KEY([Police Force Area ID])
REFERENCES [Model].[Region Data]([Police Force Area ID])

ALTER TABLE [Model].[Knife Crime London Data]
ADD FOREIGN KEY([Local Authority District ID ])
REFERENCES [Model].[Local Authority District]([Local Authority District
   ID])

ALTER TABLE [Model].[Geography Data] with nocheck
ADD FOREIGN KEY([Local Authority District ID])
REFERENCES [Model].[Local Authority District]([Local Authority District
   ID])

ALTER TABLE [Model].[Date DIMENSION] with nocheck
ADD FOREIGN KEY([Financial Year])
REFERENCES Model.[Financial Year LOOKUP]([Financial Year])

ALTER TABLE [Model].[Knife Crime Country DIMENSION] with nocheck
ADD FOREIGN KEY([Financial Year])
REFERENCES Model.[Financial Year LOOKUP]([Financial Year])

ALTER TABLE [Model].[Knife Crime London DIMENSION] with nocheck
ADD FOREIGN KEY([Financial Year])
REFERENCES Model.[Financial Year LOOKUP]([Financial Year])

ALTER TABLE [Model].[Population Data DIMENSION] with nocheck
ADD FOREIGN KEY([Financial Year])
REFERENCES Model.[Financial Year LOOKUP]([Financial Year])
```

Listing 27: Model Keys Appendix

E Model Schema Movement

```
USE [Crime]
```

```
GO

CREATE SCHEMA [Building Model]
GO

ALTER SCHEMA [Building Model]
TRANSFER [Staged].[S Crime Data]

--TRANSFER[Staged].[ S Crime Data with Original Crime ID]

--TRANSFER[Staged].[S Knife Crime Country]

--TRANSFER[Staged].[S Knife Crime London]

--TRANSFER[Staged].[S LAD Conversion]

--TRANSFER[Staged].[S LSOA Population]

--TRANSFER[Model].[Knife Crime London]

--TRANSFER[Model].[Knife Crime Country]

--TRANSFER[Model].[Geo without Police Force]

--TRANSFER[Model].[Geo without Police Correct]

--TRANSFER[Model].[Distinct LSOA]

--TRANSFER[Model].[Population 2016]

--TRANSFER[Model].[Population 2015]

--TRANSFER[Model].[Population 2014]

--TRANSFER[Model].[National Knife Crime 2017/2018 Data]

--TRANSFER[Model].[National Knife Crime 2016/2017 Data]

--TRANSFER[Model].[National Knife Crime 2015/2016 Data]

--TRANSFER[Model].[National Knife Crime 2014/2015 Data]

--TRANSFER[Model].[National Knife Crime 2013/2014 Data]

--TRANSFER[Model].[London Knife Crime 2017/2018]
```

```
--TRANSFER[Model].[London Knife Crime 2016/2017]

--TRANSFER[Model].[Police Force Data Non Distinct]

--TRANSFER[Model].[London Knife Crime 2016/2017]

--TRANSFER[Model].[London Knife Crime 2017/2018]

--TRANSFER[Model].[National Knife Crime 2013/2014 Data]

--TRANSFER[Model].[National Knife Crime 2014/2015 Data]

--TRANSFER[Model].[National Knife Crime 2015/2016 Data]

--TRANSFER[Model].[National Knife Crime 2016/2017 Data]

--TRANSFER[Model].[National Knife Crime 2017/2018 Data]
```

Listing 28: Model Keys Appendix

F Analysis Views

```
--London
-- Crime Type

CREATE VIEW CrimeTypeComparisonLondon AS
SELECT DISTINCT
       FYL.[Financial Year] [Financial Year]
         ,COUNT(CTD.[Crime Type]) over(partition by [Crime Type], [Local
            Authority District]) [Reported Offences Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as float)) over (
            partition by [Crime Type], [Local Authority District]) [
            Reported Offences Punishment Severity]
         ,LADL.[Local Authority District][Local Authority District]
         ,CTD.[Crime Type]
         ,KCLD.[Knife Crime] [Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
```

```
INNER JOIN [Model].[Local Authority District LOOKUP] LADL
on GD.[Local Authority District ID]=LADL.[Local Authority District ID]
INNER JOIN [Model].[Knife Crime London DIMENSION] KCLD
on LADL.[Local Authority District ID]=KCLD.[Local Authority District ID ]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCLD.[Financial Year]=FYL.[Financial Year]
;

-- Crime Category

CREATE VIEW CrimeCategoryComparisonLondon AS
SELECT DISTINCT
              FYL.[Financial Year] [Financial Year]
         ,COUNT(CCL.[Crime Category]) over(partition by [Crime Category],
             [Local Authority District]) [Reported Offences Category
            Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating]as float)) over (
            partition by [Crime Type], [Local Authority District]) [
            Reported Offences Punishment Severity]
         ,LADL.[Local Authority District][Local Authority District]
         ,CCL.[Crime Category]
         ,KCLD.[Knife Crime] [Reported Knife Crime Offences]
   FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Crime Category LOOKUP] CCL
on CTD.[Crime Category ID]=CCL.[Crime Category ID]
INNER JOIN [Model].[Local Authority District LOOKUP] LADL
on GD.[Local Authority District ID]=LADL.[Local Authority District ID]
INNER JOIN [Model].[Knife Crime London DIMENSION] KCLD
on LADL.[Local Authority District ID]=KCLD.[Local Authority District ID ]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCLD.[Financial Year]=FYL.[Financial Year]
;


-- Felony or Misdemeanor
```

```
CREATE VIEW CrimeFelonyorMisdemeanorComparisonLondon AS
SELECT DISTINCT
              FYL.[Financial Year] [Financial Year]
         ,COUNT([Felony/Misdemeanor]) over(partition by [Felony/
            Misdemeanor], [Local Authority District]) [Reported Offence
            Felony/Misdemeanor Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as float)) over (
            partition by [Felony/Misdemeanor], [Local Authority District
            ]) [Reported Offences Punishment Severity]
         ,LADL.[Local Authority District][Local Authority District]
         ,FML.[Felony/Misdemeanor] [Felony or Misdemeanor]
         ,KCLD.[Knife Crime] [Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN [Model].[Felony/Misdemeanor LOOKUP] FML
on CTD.[Felony/Misdemeanor ID]= FML.[Felony/Misdemeanor ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Local Authority District LOOKUP] LADL
on GD.[Local Authority District ID]=LADL.[Local Authority District ID]
INNER JOIN [Model].[Knife Crime London DIMENSION] KCLD
on LADL.[Local Authority District ID]=KCLD.[Local Authority District ID ]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCLD.[Financial Year]=FYL.[Financial Year]


-- AVG Crime Severity

CREATE VIEW CrimeSeverityComparisonLondon AS
SELECT DISTINCT
              FYL.[Financial Year] [Financial Year]
         ,LADL.[Local Authority District][Local Authority District]
         ,AVG(CAST(CTD.[5 Scale Severity Rating] as Float)) over(
            partition by [Local Authority District]) [Reported Offences
            Severity]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as float)) over (
            partition by [Local Authority District]) [Reported Offences
            Punishment Severity]
         ,KCLD.[Knife Crime] [Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
```

```
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Local Authority District LOOKUP] LADL
on GD.[Local Authority District ID]=LADL.[Local Authority District ID]
INNER JOIN [Model].[Knife Crime London DIMENSION] KCLD
on LADL.[Local Authority District ID]=KCLD.[Local Authority District ID ]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCLD.[Financial Year]=FYL.[Financial Year]

--England
--- Crime Type
use crime
go

CREATE VIEW CrimeTypeComparisonEngland AS
SELECT DISTINCT
       FYL.[Financial Year] [Financial Year]
         ,COUNT(CTD.[Crime Type]) over(partition by [Crime Type], [Police
             Force Area]) [Reported Offences Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as float)) over (
            partition by [Crime Type], [Police Force Area]) [Reported
            Offences Punishment Severity]
         ,RDL.[Police Force Area] [England Police Force Area]
         ,CTD.[Crime Type]
         ,KCCD.[Knife Crime] [Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Region Data LOOKUP] RDL
on GD.[Police Force Area ID]=RDL.[Police Force Area ID]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN[Model].[Knife Crime COUNTry DIMENSION] KCCD
on RDL.[Police Force Area ID]=KCCD.[Police Force Area ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
```

```
on DD.[Financial Year]=FYL.[Financial Year]
and KCCD.[Financial Year]=FYL.[Financial Year];

-- Crime Category

CREATE VIEW CrimeCategoryComparisonEngland AS
SELECT DISTINCT
               FYL.[Financial Year] [Financial Year]
         ,COUNT(CCL.[Crime Category]) over(partition by [Crime Category],
             [Police Force Area]) [Reported Offences Category Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating]as float)) over (
            partition by [Crime Type], [Police Force Area]) [Reported
            Offences Punishment Severity]
         ,RDL.[Police Force Area] [England Police Force Area]
         ,CCL.[Crime Category]
         ,KCCD.[Knife Crime][Reported Knife Crime Offences]
   FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Region Data LOOKUP] RDL
on GD.[Police Force Area ID]=RDL.[Police Force Area ID]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN[Model].[Knife Crime COUNTry DIMENSION] KCCD
on RDL.[Police Force Area ID]=KCCD.[Police Force Area ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Crime Category LOOKUP] CCL
on CTD.[Crime Category ID]=CCL.[Crime Category ID]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCCD.[Financial Year]=FYL.[Financial Year];


-- Felony or Misdemeanor

CREATE VIEW CrimeFelonyorMisdemeanorComparisonEngland AS
SELECT DISTINCT
               FYL.[Financial Year] [Financial Year]
         ,COUNT([Felony/Misdemeanor]) over(partition by [Felony/
            Misdemeanor], [Police Force Area]) [Reported Offence Felony/
            Misdemeanor Total]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as float)) over (
            partition by [Felony/Misdemeanor], [Police Force Area]) [
```

```
            Reported Offences Punishment Severity]
         ,RDL.[Police Force Area] [England Police Force Area]
         ,FML.[Felony/Misdemeanor] [Felony or Misdemeanor]
         ,KCCD.[Knife Crime][Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Region Data LOOKUP] RDL
on GD.[Police Force Area ID]=RDL.[Police Force Area ID]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN [Model].[Felony/Misdemeanor LOOKUP] FML
on CTD.[Felony/Misdemeanor ID]= FML.[Felony/Misdemeanor ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN[Model].[Knife Crime COUNTry DIMENSION] KCCD
on RDL.[Police Force Area ID]=KCCD.[Police Force Area ID]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCCD.[Financial Year]=FYL.[Financial Year];

-- AVG Crime Severity

CREATE VIEW CrimeSeverityComparisonEngland AS
SELECT DISTINCT
FYL.[Financial Year] [Financial Year]
         ,RDL.[Police Force Area] [England Police Force Area]
         ,AVG(CAST(CTD.[5 Scale Severity Rating] as Float)) over(
            partition by [Police Force Area]) [Reported Offences Severity
            ]
         ,AVG(CAST(OTDD.[5 Scale Severity Rating] as float)) over (
            partition by [Police Force Area]) [Reported Offences
            Punishment Severity]
         ,KCCD.[Knife Crime] [Reported Knife Crime Offences]
  FROM [Model].[Crime Data FACT] CDF
INNER JOIN [Model].[Date DIMENSION] DD
on DD.[Date]=CDF.[Date]
INNER JOIN [Model].[Geography DIMENSION] GD
on GD.[LSOA Code]=CDF.[LSOA Code]
INNER JOIN [Model].[Region Data LOOKUP] RDL
on GD.[Police Force Area ID]=RDL.[Police Force Area ID]
INNER JOIN [Model].[Crime Type DIMENSION] CTD
on CTD.[Crime Type ID]=CDF.[Crime Type ID]
INNER JOIN[Model].[Knife Crime COUNTry DIMENSION] KCCD
```

```
on RDL.[Police Force Area ID]=KCCD.[Police Force Area ID]
INNER JOIN [Model].[Outcome Type Data DIMENSION] OTDD
on OTDD.[Outcome ID]= CDF.[Outcome ID]
INNER JOIN [Model].[Financial Year LOOKUP] FYL
on DD.[Financial Year]=FYL.[Financial Year]
and KCCD.[Financial Year]=FYL.[Financial Year];
```

Listing 29: Analysis Views Appendix