Annual Report of Child Deaths in Greater Manchester, 2017/18

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Contents

1.0 Executive Summary

1.1 Background

This is the sixth annual report reviewing data from all four Child Death Overview Panels (CDOPs) covering Greater Manchester (GM). This report includes data from cases 'closed' by the Panels from 1st April 2017 to 31st March 2018, rather than all notified cases, as this ensures a complete data set and is consistent with previous annual reports.

All under-18 child deaths, excluding still births and legal terminations of pregnancy, are referred for review to a local CDOP in England, based on residence of the child. In GM there are four CDOPs that cover the Local Safeguarding Children Board (LSCBs) of the ten local authorities:

- Bolton, Salford & Wigan
- Bury, Oldham & Rochdale
- Manchester
- Stockport, Tameside & Trafford

The CDOPs consider all the information around the child's death, identify modifiable factors and lessons that can be learned, on behalf of the LSCB. The CDOP does not determine the cause of death; that is carried out by the medical team or the coroner, depending on the circumstances. As numbers are small locally, the four GM CDOPs have collaborated to produce this combined report to allow analysis of trends and consider any implications at a Greater Manchester level.

1.2 Key Findings for Greater Manchester

- 250 deaths were notified to the 4 Greater Manchester CDOPs in 2017/18
- 274 deaths were reviewed and closed in 2017/18, including 109 (44%) of those notified
- No significant trend in rates over time is apparent across GM in death notifications or closed cases since 2012/13. However, the percentage with modifiable factors has increased steadily (see Figure 1). This in line with national infant mortality data and national CDOP data
- The proportions of deaths assigned to each category is fairly consistent over time. This year
    - 61% (169) of deaths were attributed to events around the time of birth (perinatal / neonatal event) or to chromosomal / genetic anomalies pre-dating birth.
    - Of the 15 cases attributed to 'trauma or other external factors', 9 were due to Road Traffic Collisions, with the child either as passenger, pedestrian or driver
    - There were 10 deaths attributed to suicide, representing 4% of all closed cases.
    - 7% of deaths were categorised as sudden, unexpected, death in infancy or childhood (SUDI/ SUDC) and include deaths in all age groups but are most common in 1-4 year olds.
- Under 1 year olds make up 65% of deaths and 45% are under 28 days. The official infant mortality rate for GM is 4.7 deaths registered per 1,000 live births. The rate of CDOP closed

cases last year, per 1,000 population under 1 is similar (4.8), with some variation across GM.

- Numbers of cases closed for 15-17 year olds are similar to numbers for 1-4 year olds but when population size is taken into account, the rate is higher for 15-17 than 1-4 year olds. It is unclear from this data alone why this might be but the vulnerability of older children needs careful consideration, including the risk of self-harm and suicide.

- Over half of the deaths in every age group except the youngest (0-28 days), are due to 'medical factors'[1].

- 65% of all deaths were considered to be 'expected' with higher proportions in children under 28 days and 5-9 age groups than others (including 28-364 days and 1-4 year olds).

- 58% of closed cases involved male children and 42% female, in line with international mortality rates. This male disadvantage was present in every age group this year, with the most stark difference in under 1s (61% male, 39% female, resulting in GM rates of 5.39 under 1 male CDOP cases closed per 1000 male live births to 4.06 for girls under 1 per 1,000 female live births). This difference is focused on perinatal / neonatal events as cause of death, as congenital/genetic anomalies show no sex difference.

- White British children make up roughly 80% of the GM population but only 52% of the closed cases last year. The next most common ethnicities of children whose deaths were reviewed were Pakistani (16%) and Black African (8%), who are significantly over-represented compared to the population.

- 37% of the under 18 population of GM live in the most deprived quintile (nationally) but 61% of deaths were of children who live in this quintile. 80% of children whose deaths were closed lived in the two most deprived quintiles nationally.

- Modifiable factors (defined in chapter 4) were identified in 110 (40%) of the cases closed. This is another increase from previous years (see Figure 1 below), in keeping with the national trend. GM is consistently above the national average for modifiable factors identified but this is a somewhat subjective decision so can be hard to compare.

- In these 110 cases, 175 modifiable factors were cited; the most common being smoking (in the household or in pregnancy), high BMI of mother, alcohol/substance misuse by parent, access to or uptake of health/care services and unsafe sleeping (in that order). Of those where modifiable factors were identified, 67% had only one factor; 33% had two or more.

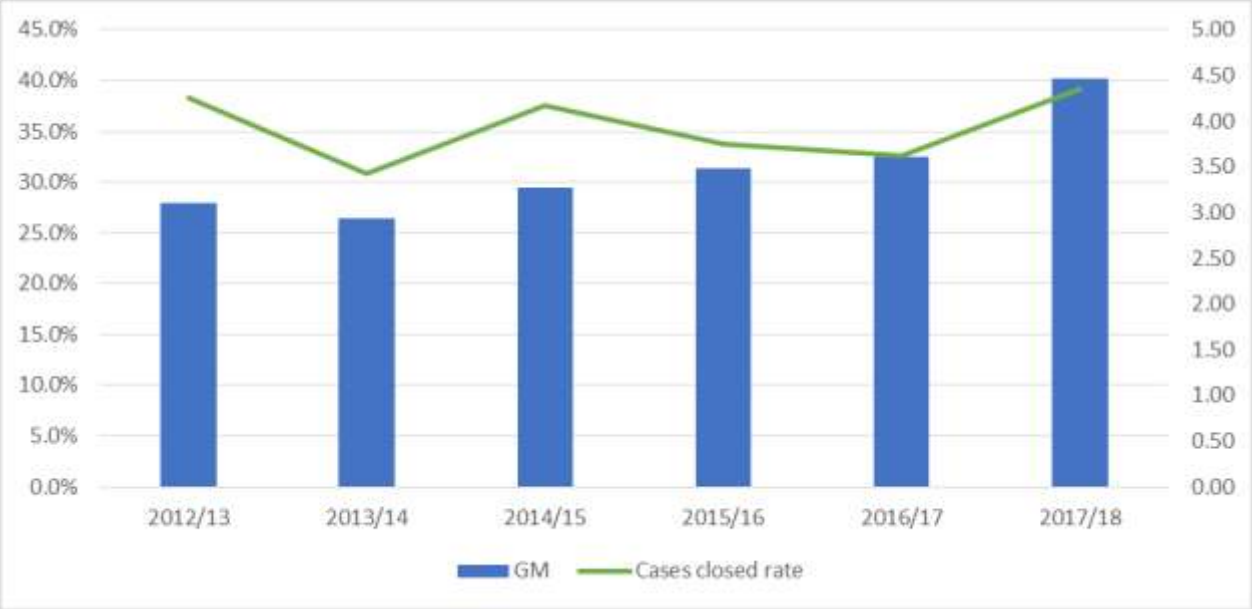
- A wider range of risk factors were identified as relevant in terms of either increasing the child's vulnerability or explaining the death (whether or not they were modifiable). These are explored in section 4 but, in addition to the above factors, consanguinity, parental mental or physical health/disability and parenting issues, including domestic abuse, were often background risks for children whose deaths were closed. This is in line with research around Adverse Childhood Experiences, which suggests that there are certain factors such as these which increases the risk of poorer outcomes in later life, and may also increase the risk of short term poor outcomes, including death.

- Whilst poor parenting/child abuse/neglect was identified as a modifiable factor in only 5 cases it was cited as a relevant factor in 11% of child death reviews.

[1] counting categories of: malignancy, acute medical or surgical condition, chronic medical condition, chromosomal, genetic and congenital anomalies, perinatal / neonatal event, infection

- A number of families (34%) whose children were the subject of a review had statutory involvement from social care in the form of a Child Protection Plan or Statutory Order (either previously or at time of death for the child and/or a sibling). These are crude measures of the type of need or involvement but the higher level of intervention than would be seen in the wider population supports the findings about risk factors and vulnerabilities discussed in Chapter 4.

Figure 1 - Rate of closed cases (per 100,000 population) and % with modifiable factors



2.0 Introduction

In 2004, the Children Act required each local authority to establish a Local Safeguarding Children Board (LCSB) to safeguard and promote the welfare of children in their area. Since 2008 LCSBs have had a statutory responsibility to make arrangements for Child Death Overview Panels (CDOP) to review the death of any under-18 year old normally resident in their area[2]. The CDOPs consider all the information around the child's death, any outstanding risks to the family or community and lessons that could be learned, to inform the LSCB's strategic planning. They are specifically required to identify any 'modifiable factors', where actions (at a national or local level) could be taken to reduce the risks of future child deaths.

They also consider local bereavement support arrangements and any on-going risks to the family or community. The CDOP does not determine the cause of death; that is carried out by the medical team or the coroner, depending on the circumstances and the CDOP waits until any Serious Case Review, inquest or criminal / other investigation has concluded before reviewing the case.

In GM there are four Child Death Overview Panels to review cases for the ten LSCBs:

- Bolton, Salford & Wigan
- Bury, Oldham & Rochdale
- Manchester
- Stockport, Tameside & Trafford

This is the sixth Annual Report reviewing data from all four Child Death Overview Panels (CDOPs) covering Greater Manchester. This report focuses on the cases that were 'closed' by the four panels from 1st April 2017 to 31st March 2018 and includes data on the, number and duration of reviews, demographics of the cases, causes of death and risk factors. It does not analyse notified cases in detail as these do not constitute a complete data set as many cases are not closed within the year they are notified. This allows clearer comparisons between CDOPs and is consistent with previous years. The outcomes of all cases closed by CDOPs are collected nationally by the Department for Education to form national reports[3], although responsibility has now changed to the Department of Health and Social Care. As numbers are thankfully small locally, the Greater Manchester CDOPs produce this combined report to allow more detailed analysis and comparison between different areas and to consider any implications at a Greater Manchester level.

2.1 Child deaths in the UK

Infant and child death rates in the UK have seen a 60.4% reduction since 1984 in England and Wales. However, the rate of change varies and despite a significant decrease between 2006 and 2015, there appears to have been a plateau since then.

National figures are published separately for infant (under 1 year) and child (1-15 / 17 years). ONS infant (under 1) mortality figures show a year on year increase between 2014 and 2016 for deaths occurring in that year, from 3.6 to 3.8 per 1,000 live births[4] (other ONS publications are based on deaths registered in a certain year and show a plateaued rate of 3.9 over the last 3 years). Infant

[2] Working Together 2015. Available here: https://www.gov.uk/government/publications/working-together-to-safeguard-children--2

[3] For latest Department for Education CDOP report see: https://www.gov.uk/government/statistics/child-death-reviews-year-ending-31-march-2017

[4] ONS Statistical Bulletin, 2018, *Child Mortality in England and Wales: 2016*.

mortality rates in the North West and Greater Manchester are consistently higher than the England rate (see Table 1) and show a similar small increase in recent years after significant decline.

NW *child* (age 1-17) mortality rates are also higher than the England rate and these also appear to be plateauing although they appear to be rising in some areas of GM, with Stockport and Manchester notable exceptions where a small downward trend is apparent[5]

Table 1 - Mortality Rates, 2016

	Greater Manchester	North West	England
Infant Mortality Rate (deaths occurring in the year, per 1,000 live births that year)	5.5	4.9	3.8
Child Mortality Rate (1-17 year olds) per 100,000 population of same age	15*	14.3	11.6

* Calculated as an average of the 10 individual LA rates as these figures are not available routinely at GM level through ONS releases or PHE Fingertips tool

Although there have been significant improvements in child death rates in the UK and locally, the recent plateau and early signs of an increase are concerning. The UK still has worse childhood mortality rates than some other Northern European countries[6], with particularly high rates of infant deaths, which make up the majority of childhood deaths, and there continues to be marked social inequalities in death rates. ONS 'avoidable mortality' figures state that 34% of deaths of children (age 0-19) in the UK are considered avoidable. The GM CDOPs identified modifiable factors in 40% of cases and this is explored further below.

3.0 Socio-demographics of cases closed in 2017/18

3.1 Notified Deaths, Closed Cases 2017/18 and trends over time

There were 250 deaths notified to the 4 Greater Manchester CDOPs in 2017/18. 274 deaths were reviewed and closed, including 109 (44%) of those notified in the same year. Figures 2 and 3 show the proportion from each LA and Table 2 shows the numbers and rates for each LA and CDOP.

Figure 3 - Proportion of closed cases from each LA (GM total = 274)

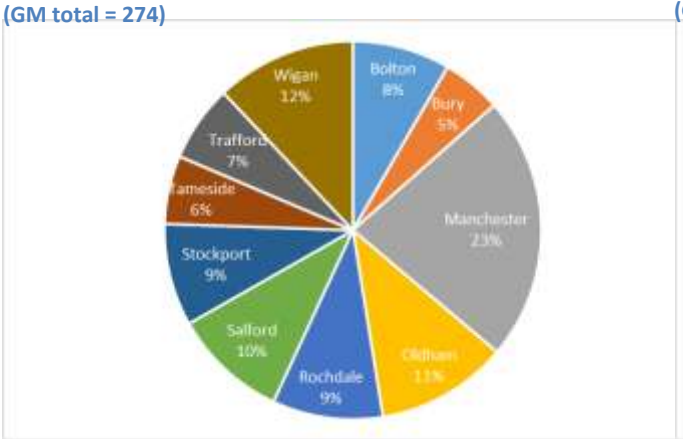
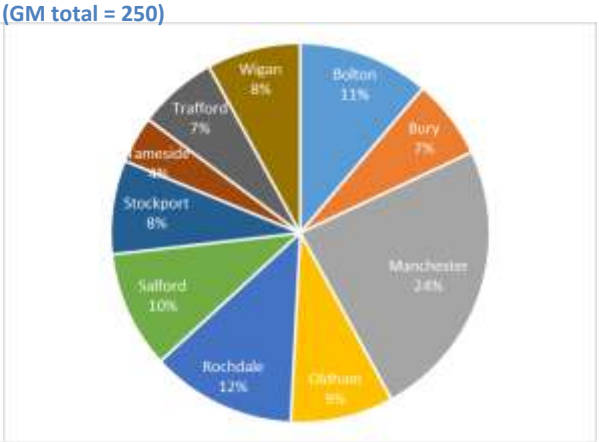


Figure 2 - Proportion of notified deaths from each LA (GM total = 250)



[5] PHE Fingertips Tool – Child and maternal health profiles, 2018.

[6] Wolfe I, MacFarlane A, Donkin A, Marmot M, Viner R. *Why children die: death in infants, children, and young people in the UK - Part A.* London : RCPCH, NCB, BACAPH, May 2014.

Table 2 - Number and rate of deaths notified and cases closed 2017-18 by LA and CDOP

LA	Deaths Notified (number)	Deaths Notified (rate per 10,000 population)	Closed cases (number)	Closed cases (rate per 10,000 population)
Bolton	28	4.18	23	3.44
Bury	17	3.96	14	3.27
Manchester	60	5.01	62	5.17
Oldham	22	3.74	31	5.27
Rochdale	31	6.02	26	5.05
Salford	25	4.56	27	4.92
Stockport	20	3.21	24	3.85
Tameside	10	2.03	16	3.24
Trafford	17	3.09	18	3.28
Wigan	20	2.95	33	4.86
Bolton, Salford, Wigan	**73**	**3.85**	**83**	**4.38**
Bury, Oldham & Rochdale	**70**	**4.57**	**71**	**4.64**
Manchester	**60**	**5.01**	**62**	**5.17**
Stockport, Tameside & Trafford	**47**	**2.82**	**58**	**3.48**
Greater Manchester	**250**	**3.97**	**274**	**4.35**

Trends

Table 3 and Figure 4 below, show the rate of cases closed over 5 years per 10,000 0-17 year olds, based on 2016 mid-year population estimates (see Appendix 3 for population estimates used). Overall, no trend is apparent across GM in either cases closed or notifications since 2012/13. This is in line with national mortality rates described above, where the long term trend is a decrease but this appears to have levelled out in recent years[7], particularly for infant mortality rates, which make up the majority of deaths locally and nationally and so will influence the overall 0-17 rates. However, partners should be conscious of the national trend and risk of increasing death rates, as whilst no significant trend is apparent, there is no decrease which was the historic pattern and absolute rates have increased slightly for some areas.

The number of cases closed is the highest in the 6 years of data but 56% of these were deaths that were notified before the 2017/18 year so this is a measure of CDOP activity not necessarily trends in deaths.

[7] ONS Statistical Bulletin, 2018, *Child Mortality in England and Wales: 2016*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/childhoodinfantandperinatalmortalityinenglandandwales/2016

Figure 4 rate of closed cases by CDOP with GM rate overlay (2012/13 – 2017/18)

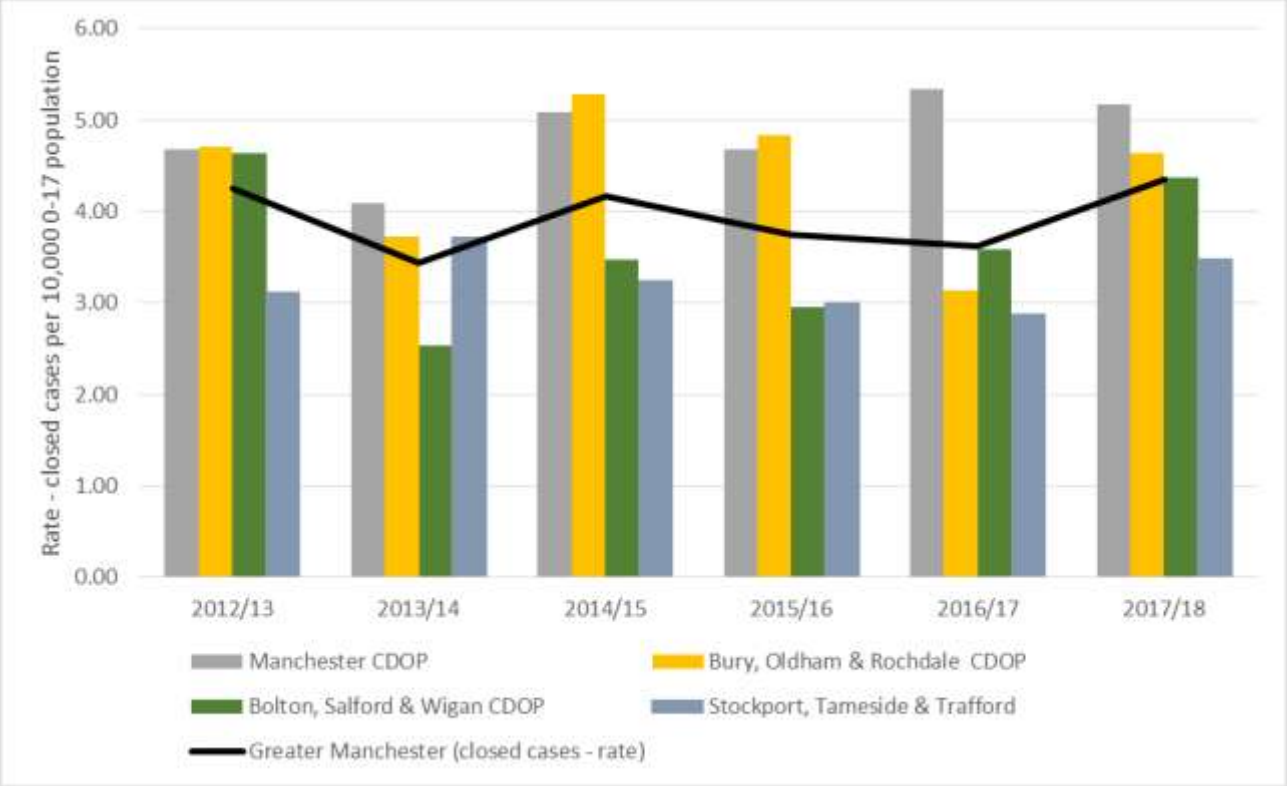


Table 3 - Rate of CDOP closed cases per 10,000 0-17 population*

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	*Average over 6 years*
Bury	4.66	3.03	3.96	3.96	2.57	3.27	*3.58*
Oldham	4.25	3.40	4.76	4.76	4.08	5.27	*4.42*
Rochdale	5.25	4.66	7.00	5.64	2.53	5.05	*5.02*
Bolton	6.43	2.54	2.99	1.79	3.44	3.44	*3.44*
Salford	4.92	2.19	3.46	4.19	3.83	4.92	*3.92*
Wigan	2.65	2.80	3.98	3.10	3.54	4.86	*3.49*
Stockport	2.89	2.89	2.24	3.21	3.37	3.85	*3.07*
Tameside	3.24	3.04	5.07	2.84	3.24	3.24	*3.44*
Trafford	3.28	5.28	2.73	2.91	2.00	3.28	*3.25*
Manchester	**4.67**	**4.09**	**5.09**	**4.67**	**5.34**	**5.17**	***4.84***
Bury, Oldham & Rochdale CDOP	**4.70**	**3.72**	**5.29**	**4.83**	**3.13**	**4.64**	***4.39***
Bolton, Salford & Wigan CDOP	**4.64**	**2.53**	**3.48**	**2.95**	**3.59**	**4.38**	***3.59***
Stockport, Tameside & Trafford	**3.12**	**3.72**	**3.24**	**3.00**	**2.88**	**3.48**	***3.24***
Greater Manchester	**4.26**	**3.43**	**4.16**	**3.75**	**3.62**	**4.35**	***3.85***

* Using ONS 2016 mid-year population estimates

The rates in individual local authorities over the 6 years vary but due to very small numbers these change over time are likely to be due to chance and it is difficult to draw any conclusions,

particularly as closed cases do not represent the rate of deaths in a given year. Some authorities have *consistently* higher or lower rates than others over time, which are more likely to reflect real differences in demographics, risk factors and service provision. The infant mortality rates for GM LAs (per 1000 live births) are displayed in Figure 5, with RAG rating comparing with the GM rate. Figure 6 shows the child mortality rates for each GM LA (age standardised rate per 100,000) between 2010 and 2016, mapped against the England rate. These graphs are taken from PHE Fingertips tool[8], which is publically available and provides data on a range of indicators.

Figure 5 - Infant Mortality Rates 2014-16, by LA (crude rate per 1000 live births) with RAG rating compared to GM rate

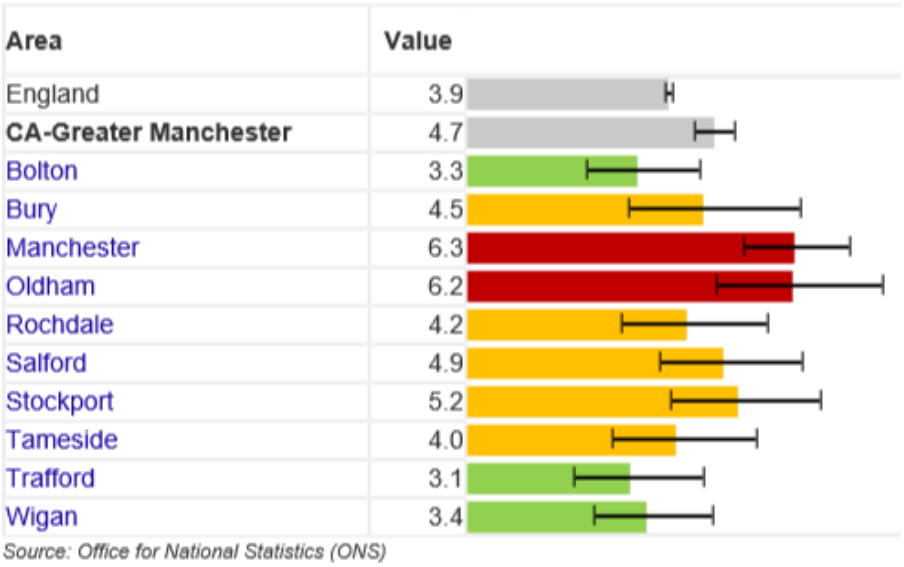
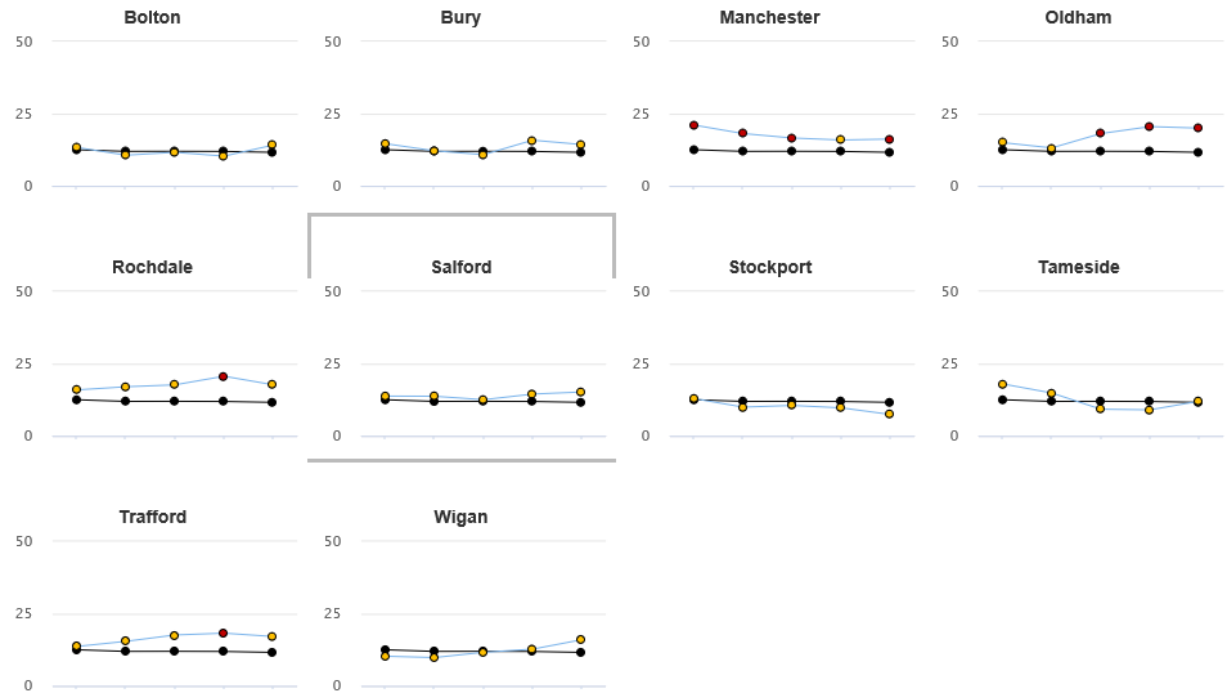


Figure 6 - Child mortality rates 2010 - 2016 (ages 1-17, directly standardised rate per 100,000)



[8] Public Health England, 'Fingertips Tool' Child Health Profiles, Available at: https://fingertips.phe.org.uk/profile-group/child-health/profile/child-health-overview/data#page/4/gid/1938132992/pat/126/par/E47000001/ati/102/are/E08000001/iid/90801/age/177/sex/4

3.2 Duration of Reviews

The duration of a review is the length of time it takes from the date of notification of death until the review is closed. Complex cases that require investigation such as by the Coroner or the Crown Prosecution Service (CPS) or which require a Serious Case Review will take much longer to close as a CDOP will not review these cases until the investigations have been completed. The cause of death can also affect the duration of the review.

In 2017/18 the average length of a CDOP review was 269 days, with the longest taking 1653 days and the shortest 29 days. 6 cases took over 1000 days to close.

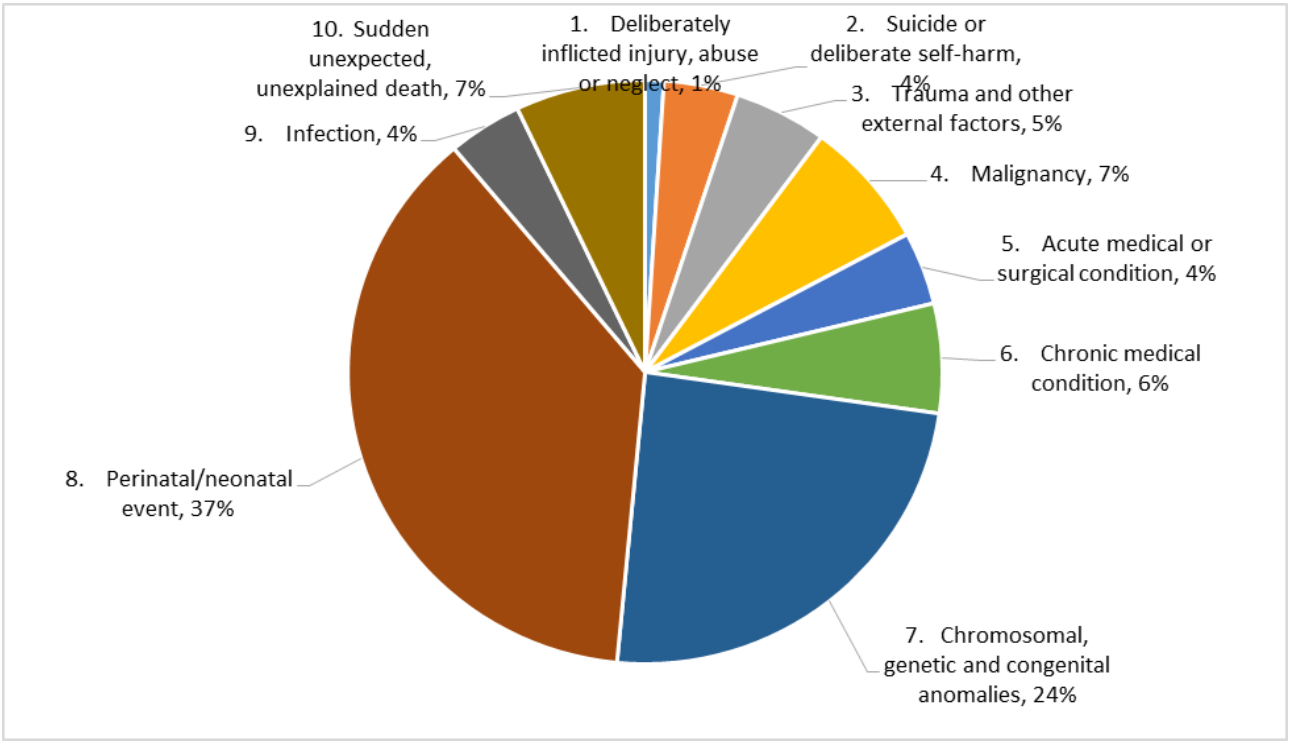
3.3 Causes/Category of death

There are ten nationally defined categories that a CDOP can use when reviewing a death and each case must be assigned to one of these categories:

1. Deliberately inflicted injury, abuse or neglect
2. Suicide or deliberate self-harm
3. Trauma and other external factors
4. Malignancy
5. Acute medical or surgical conditions
6. Chronic medical condition
7. Chromosomal genetic and congenital anomalies
8. Perinatal/neonatal event
9. Infection
10. Sudden, unexpected, unexplained death

This classification is hierarchical; where more than one category could reasonably be applied, the highest up the list should be marked. It may not always be clear cut which category a case falls into and individual panels have to exercise their judgement. The chairs and managers of the four GM CDOPs regularly discuss a small number of cases in order to moderate the approaches to try and increase consistency. Figure 7 shows the breakdown of all closed cases in GM by the category assigned by the CDOP.

Figure 7 - GM closed cases by cause of death category



These proportions have remained fairly stable over time, with the largest proportions always being classified as resulting from events around the time of birth (perinatal/neonatal event) or from genetic and congenital anomalies conditions which pre-date birth (61% of total in these two categories). This is consistent with national CDOP findings and reflects the age breakdown of child deaths, discussed in section 3.4 below. It is notable that no deaths were classified as caused by 'deliberately inflicted injury, abuse or neglect' in the previous 2 years but sadly this year 2 closed cases were assigned this cause. This is still fewer than the years before 2015/16 and hopefully represents a long term minimisation of deaths in this category.

The non-intentional trauma and other external factors category was assigned to 15 (5%) of cases closed, of which 9 were described as Road Traffic Collisions, including babies, children and teenagers who were a mixture of passengers, pedestrians and drivers, including of a motorbike.

See Appendix 2 for a breakdown of categories assigned to closed cases over time.

3.4 Age

Figure 8 shows the breakdown of closed cases by age group. This shows that under 1 year olds make up the majority of deaths (65%), with 45% being under 28 days. It also highlights that numbers of cases closed for 15-17 year olds are similar to numbers for 1-4 year olds. When the population size is taken into account, the rate of closed cases in the 15-17 age group is higher than 1-4 year olds so the vulnerabilities of this older group need particular consideration by both children and (young) adult services. This could be an area for consideration as part of longer term See Table 4 for rates by age group for Greater Manchester.

Figure 8 - Closed cases by age group and CDOP

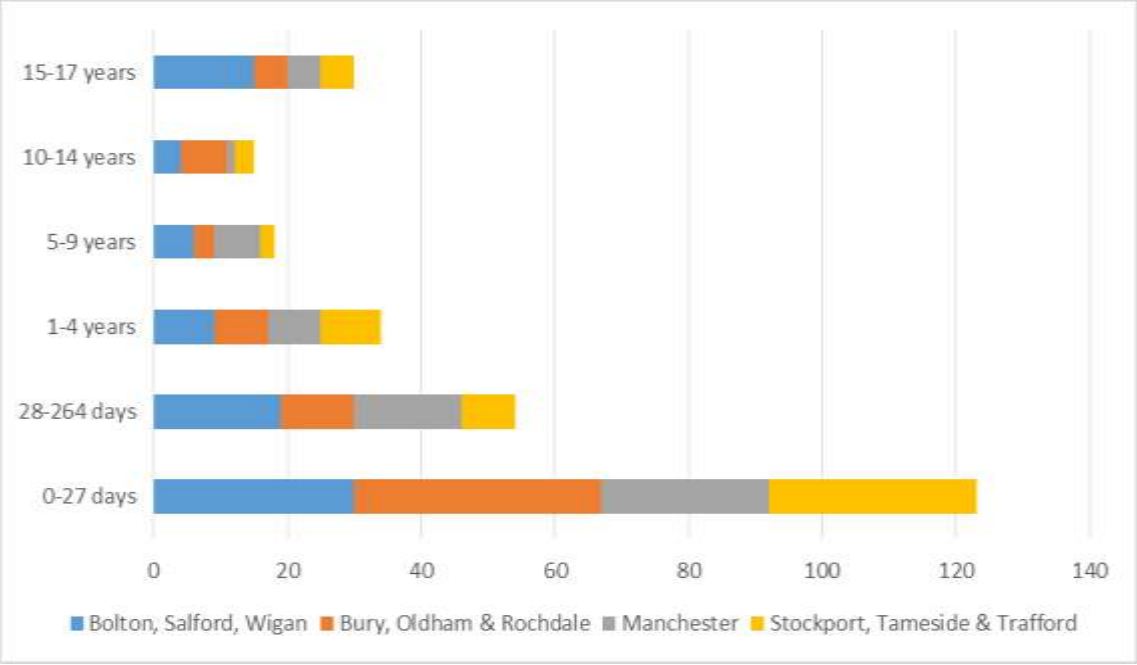


Table 4- Rate of closed cases per 10,000 population in each age group (GM)

Age group (years)	Under 1	1-4	5-9	10-14	15-17
Closed cases per 10000 population	47.68	2.26	0.98	0.93	3.13

Under 1 year olds make up the majority of cases closed in all CDOPs; infant mortality is explored further below. The proportions of cases closed in the other age groups are similar, with small

variations likely due to chance given the small numbers, shown in the graph. However, the proportion (and number) of cases closed for 15-17 year olds for Bolton, Salford and Wigan CDOP is notably larger than the other three CDOPs and may warrant further investigation (see Figure 9). Numbers in each age group are very small so these are unlikely to be statistically significant differences and some differences could represent features of the CDOP process that might, for example, have led to similar cases being closed around the same time.

Figure 9 - Proportion of closed cases in each age group by CDOP

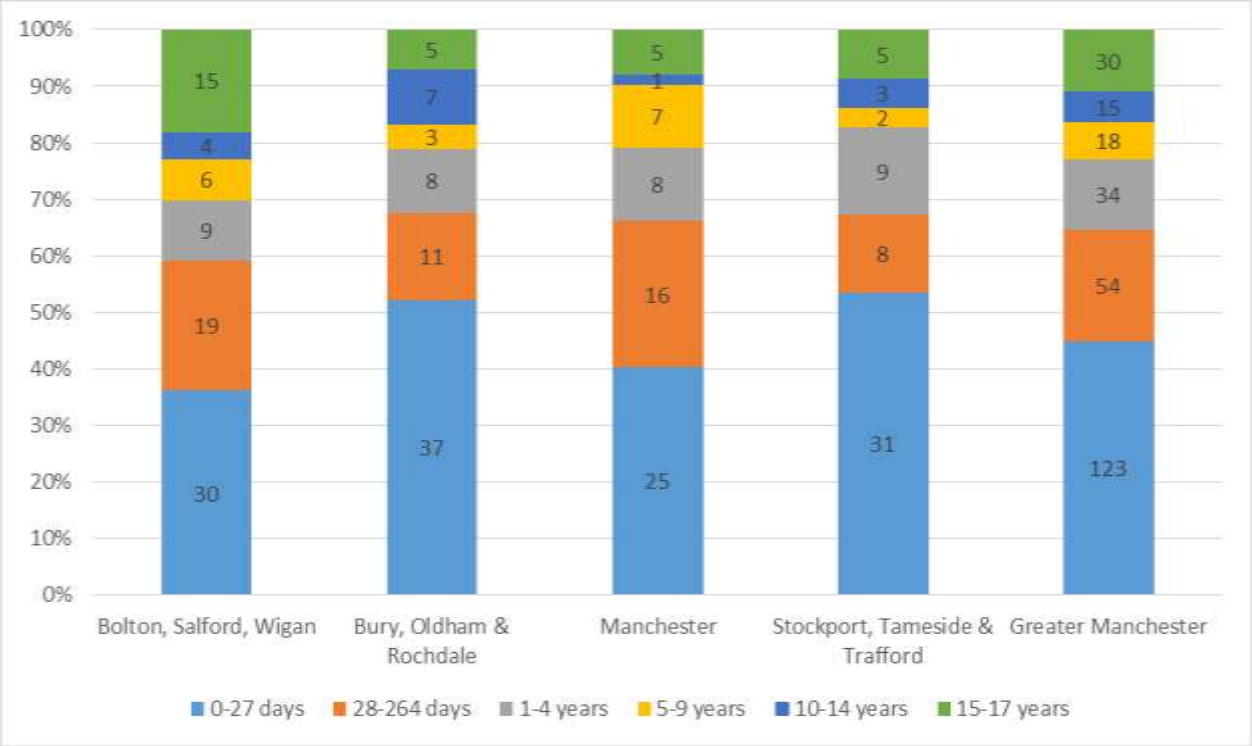


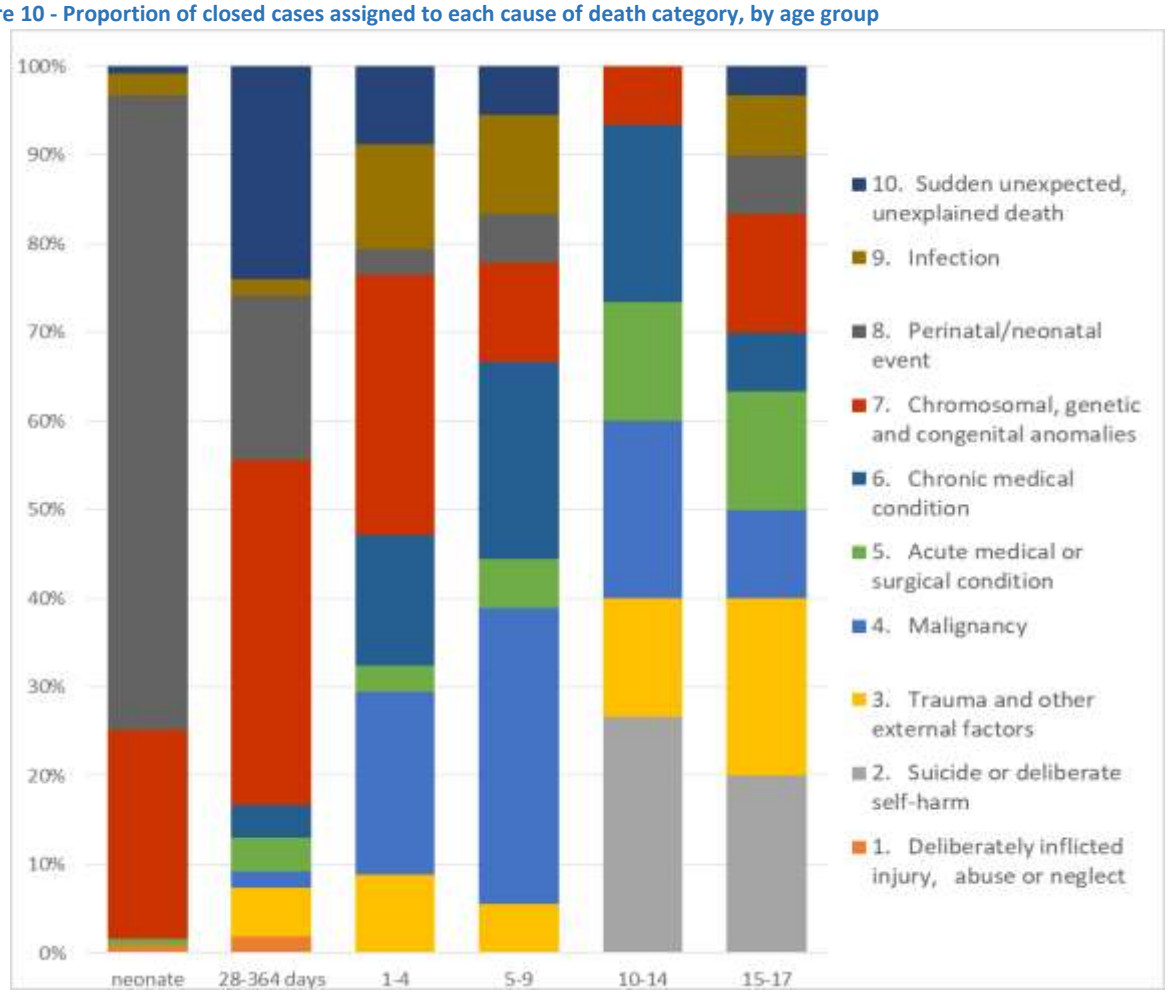
Figure 10 shows how cause of death varies by age group. As above, the majority of deaths of under-1s are caused by perinatal or neonatal events or chromosomal or genetic factors. Trauma also plays a small but significant role in all age groups over 28 days and suicide emerges as a significant cause of death for older children (see 4.10).

Over half of the deaths in every age group except the youngest (0-28 days), are due to 'medical factors'[9]. However, many of those medical conditions or the outcomes for those children are influenced by the conditions that children (and families) live in and the support their families receive and there may be modifiable factors or lessons to be learnt, even if the death was 'expected'. For example, research shows that congenital anomalies contribute approximately one third of the extra infant deaths experienced by lower socio -economic groups compared with the population as a whole, highlighting how inequality impacts health even pre-birth[10]. Death rates for different socio-economic groups and modifiable factors are explored further in subsequent sections.

[9] counting categories of: malignancy, acute medical or surgical condition, chronic medical condition, chromosomal, genetic and congenital anomalies, perinatal / neonatal event, infection

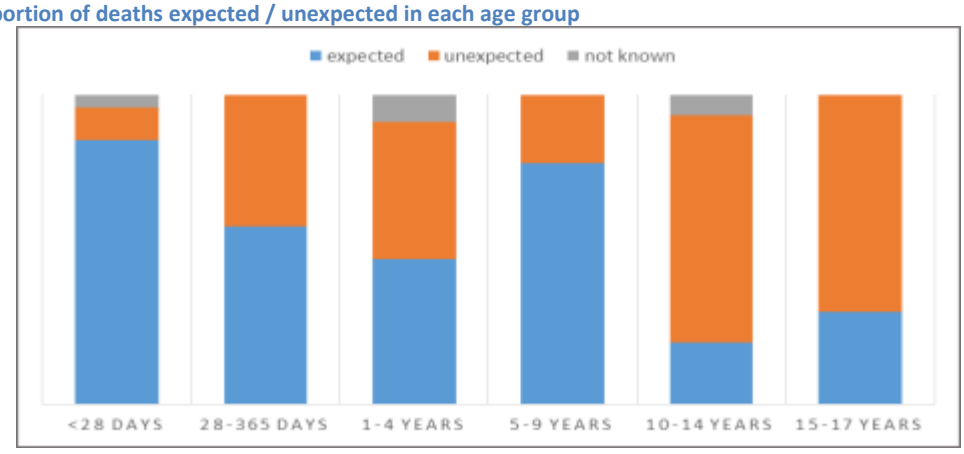
[10] **National Perinatal Epidemiology Unit.** The contribution of congenital anomalies to infant mortality. Oxford: University of Oxford, 2010. Inequalities in Infant Mortality Project Briefing Paper 4.

Figure 10 - Proportion of closed cases assigned to each cause of death category, by age group



Patterns in cause of death by age correspond to some extent (though not directly) to whether the death was 'unexpected' or not, defined as "*the death of an infant or child which was not anticipated as a significant possibility for example, 24 hours before the death; or where there was an unexpected collapse or incident leading to or precipitating the events which lead to the death*"[11] (see Figure 11). The overall proportion of deaths categorised as 'expected' has remained stable over the last 4 years (60-69%). It is suggested that some improvements have been made in medical and social care of children with known life-limiting conditions, meaning more children may survive infancy and live longer. This may increase the overall population of children with these conditions, meaning numbers of deaths could stay the same but rates of death in that population may reduce. It may also lead to a change in the age breakdown of deaths of children with life-limiting conditions.

Figure 11 - proportion of deaths expected / unexpected in each age group



[11] Working Together 2015

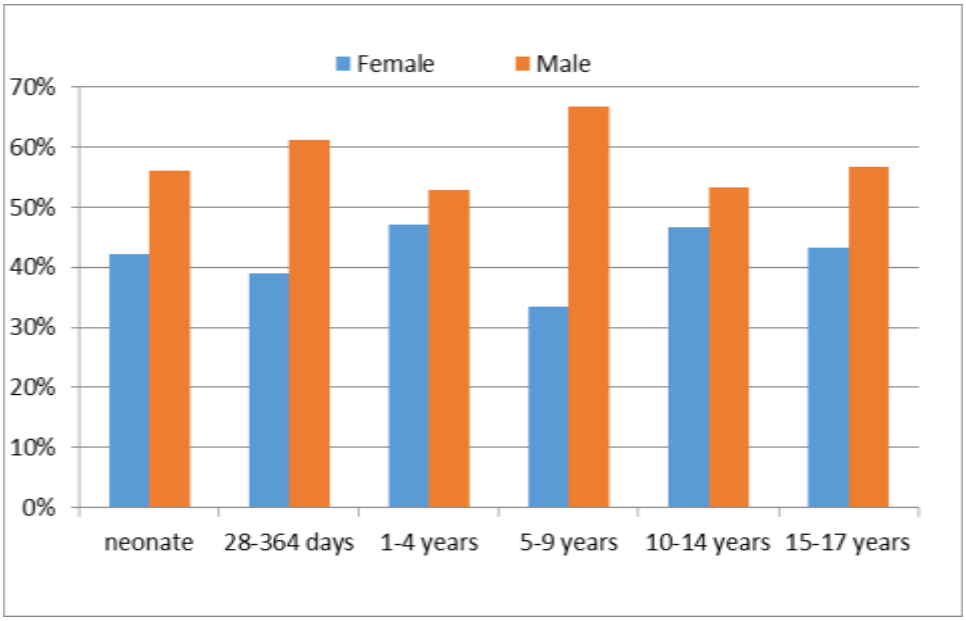
It is notable that the proportion of deaths of 1-4 year olds categorised as expected (47%) is lower than 5-9 year olds (78%), although the latter age group involves very few cases so the absolute difference is not as striking. The actual numbers of deaths attributed to malignancy and chronic medical conditions were similar for both age groups but there were more deaths of 1-4 year olds overall, and larger numbers due to causes usually categorised as unexpected, such as trauma, infection and 'sudden, unexpected, unexplained deaths in infancy or childhood' (SUDI or SUDC).
A large proportion of 1-4 year olds died from chromosomal, genetic and congenital conditions but deaths in this group can be categorised as expected or unexpected depending on the immediate circumstances surrounding the death, even if a condition was expected to be life limiting at some point in future.

SUDC 'feature in every age group except 10-14 year olds but is most common in deaths of children aged between 28 days and 1 year. Deaths of babies under 28 days are rarely categorised as SUDC, which may be due to the availability of a specific peri-/neonatal category higher up the categorisation checklist, or may reflect the higher level of intervention and oversight in the care of the youngest babies, for example. These deaths have been the focus of various safeguarding campaigns as there is some evidence of factors which appear to increase risk, despite the unclear mechanism for what happened. Some of these factors are then included as modifiable factors or noted in CDOP reviews. These are explored further below but include smoking in the household, overheating, co-sleeping, particularly after using alcohol / drugs, and obesity of mothers at birth.

3.5 Sex

Of the 274 closed cases in Greater Manchester, 157 (58%) were male and 115 (42%) were female. The numbers are still quite small so the difference could be exaggerated by random variation but this trend is consistent (see Appendix 1 for overview of cases over time) and is replicated in national figures and international research[12]. Figure 12 shows the breakdown by age group for GM CDOPs closed cases, showing that male children were over-represented in each age group. The difference is most stark in under 1s, both locally in closed cases (61% male, 39% female) and nationally in terms of 2016 registered deaths (56% to 44%). Locally, 5-9 year olds show a significant male disadvantage (67% of cases male, 33% female), though this involves very small numbers so this larger difference represents a fairly small actual difference in cases.

Figure 12 - Cases closed by sex and age group



[12] Drevenstedt, G. et al, 2008, The rise and fall of excess male infant mortality. Proceedings of the national academy of sciences in the United States. Available here: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2278210/

More boys are also born than girls (1053 boys are born for every 1000 girls). However, this does not fully account for the variation in death rates. Taking into account the live births for each sex, the England and Wales infant mortality rate for boys was 4.22 deaths registered per 1000 live births whereas for girls this was 3.55 per 1000 live births. This is a statistically significant difference at the 5% level[13]. In Greater Manchester, 5.39 CDOP cases are closed for boys under 1 per 1000 male live births, and only 4.06 for girls under 1 per 1000 female live births. CDOP closed cases are not an accurate measure of deaths in the year but as this is a pattern across previous annual reports, it seems likely to be a true difference that echoes the national picture. Official mortality statistics would confirm the scale of the gap in mortality rates locally to compare with national figures.

There is not much commentary on this significant difference between the sexes in recent publications (research or strategies) on child or infant mortality but it is supported by large scale population studies[9][14]. Research from 2008 studying records from 15 developed countries found that the gap between mortality rates reached a peak in the late 70s but has narrowed recently so that boys in the 2000s had about a 20 percent higher chance of death by age one than girls[15]. Theories vary about the cause of the inequality and the reasons for the narrowing of the gap but beyond the uneven birth rate, boys are also more likely to be born prematurely and so to have lower birth weight which is known to increase the risk of death under 1 year. (See 3.6 below).

Breaking down cause of death by sex for GM CDOP cases shows that differences are focused in certain causes (see Table 5). It is notable that in both local CDOP figures and national ONS data, deaths caused by chromosomal or genetic anomalies do not show a gender disparity, despite being the second largest cause of death in CDOP infant cases, so the increased risk for boys is focused on perinatal / neonatal events. Males are also over-represented locally (and nationally) in deaths caused by trauma, suicide and chronic medical conditions, although these involve small numbers locally so will require longer term data analysis to establish if this is a true difference.

The disparity in infant rates, particularly for the youngest babies, appears likely to be due to biological factors which may be hard to change significantly but some investigation into this – and any impact of social / healthcare factors which could help to close this gap in the different categories is important.

Table 5 - Cause of death by sex

		Female	Male	% male
1	**Deliberately inflicted injury, abuse or neglect**	<5	0	0%
2	**Suicide or deliberate self-harm**	3	7	70%
3	**Trauma and other external factors**	4	11	73%
4	**Malignancy**	9	11	55%
5	**Acute medical or surgical condition**	5	6	55%
6	**Chronic medical condition**	6	10	63%
7	**Chromosomal, genetic and congenital anomalies**	31	35	53%
8	**Perinatal/neonatal event**	39	62	61%
9	**Infection**	5	7	58%
10	**Sudden unexpected, unexplained death**	11	8	42%

[13] This means there is a less than 5% chance that this difference is simply due to chance, rather than a true difference with an underlying cause.

[14] Zhao, D. et al, 2016, *Gender Differences in Infant Mortality and Neonatal Morbidity in Mixed-Gender Twins*. Scientific Reports, 7, 8736: 1-6. Available here: http://www.nature.com/articles/s41598-017-08951-6

[15] Drevenstedt, G., et al., 2008, *The rise and fall of excess male infant mortality,* Proceedings of the National Academy of Sciences of the United States of America, 105 (13), 5016-5021.

3.6 Infant Mortality

Greater Manchester has consistently higher rates of infant mortality than the England and North West average, as described in Section 2.1. Rates of deaths of children under 1 are more than 20 times that of children aged 1-4 and 15 times that of 15-17 year olds and the majority of deaths under 1 are in the first 28 days of life due to the vulnerability of this group to both medical and social risks.

This report will not thoroughly examine the features of infant deaths as there are other sources of data and information on this important subject[16]. But whilst CDOP closed cases do not represent death rates for that year (as less than 50% of notified deaths are closed in-year), they provide an insight into recent differences between CDOP areas and the local rates are worth noting. The proportion of CDOP cases under 1 in each panel are similar (about 60%) but the rates, taking into account the population size for under 1s in each CDOP area, show some variation (see Table 6, columns 4 and 3). The other rates shown in column 2, for comparison, are from ONS published figures based on death registrations per 1,000 live births for 2016 calendar year and differ slightly to the rates given in section 2.1 which refer to death occurrences and combine data for 2014-16. These rates are not available easily by CDOP area so were not used here.

Table 6 - Infant deaths (cases closed) rate, number and proportion, by CDOP

1. CDOP area	2. ONS Infant Mortality Rate (deaths registered per 1,000 live births) 2014-2016	3. Rate (CDOP closed cases per 1,000 population) Infants under 1 year	4. % of all cases closed		
			0-27 days	28-364 days	All under 1
Bolton, Salford & Wigan	3.9	4.4	36.1%	22.9%	59.0%
Stockport, Tameside & Trafford	4.1	4.2	52.1%	15.5%	67.6%
Manchester	6.3	5.1	40.3%	25.8%	66.1%
Bury, Oldham & Rochdale	5	5.5	53.4%	13.8%	67.2%
GM	**4.7**	**4.8**	**44.9%**	**19.7%**	**64.6%**
England	**3.9**				

Most under-1 deaths occur due to perinatal events or chromosomal / genetic factors, often resulting in or caused by prematurity and/or low birth weight. Death rates correlate strongly with birth weight, with around half of all deaths of children under 1 happening in those born weighing less than 1500g. National statistics show that for babies of low birthweight (less than 2,500 grams), the age of the mother appears to affect the infant mortality rate, with the most noticeable rate increase of 29.2% seen in mothers aged 40 and over. Birth weight is linked to maternal health which strongly correlates with socio-economic status. Some of the determinants of health and modifiable factors are explored further below. Refer also to the section above on vulnerability of boys to infant death likely due to biological factors.

[16] See, for review, Parliamentary briefing, 2016. Available at: http://researchbriefings.files.parliament.uk/documents/POST-PN-0527/POST-PN-0527.pdf
See also ONS statistical releases on infant mortality, birth cohort tables and child mortality which present infant death rates with various definitions. Also, ONS, *Pregnancy and ethnic factors influencing births and infant mortality: 2013*. Link below.

Historically many of the excess deaths of babies under 1 occurred in the neonatal period, however, improvements in medical care mean that more premature babies are surviving the neonatal period. This has the effect of increasing the number of cases where prematurity is the cause of death in infants up to 1. Babies under 28 days are still the most vulnerable and the vast majority (72%) are categorised as due to a perinatal / neonatal event, with deaths of children aged between 1 month and 1 year more likely to be attributed to chromosomal or genetic anomalies (39%) than any other single category.

The youngest children are also particularly vulnerable to other medical and social risks. Sadly, the two cases closed in 2017/18 that were categorised as 'deliberately inflicted injury, abuse or neglect' were under 1 year old and three deaths in this age group were due to an accidental injury or trauma.

3.7 Ethnicity

All closed cases in GM record ethnicity and this year for the first time a more detailed categorisation was used to distinguish between children from different White, Asian, Black and Mixed ethnicities. This shows that after White British (52%), the next most common ethnicities were Pakistani (16%) and Black African (8%); with considerably higher numbers of cases closed than children from other Asian/British or Black/British ethnicities. These groups are significantly over-represented when compared to the GM population. Figures 13 and 14 below show the cases closed and the GM population, using broader ethnicity groupings available nationally. These show that Non-White-British children are over-represented in GM child deaths, representing only 28.5% of the population[17] but 48% of the child death cases closed in 2017/18. The under-18 population estimates are based on 2011 Census data which is now somewhat out of date but unlikely to have changed radically enough to impact this inequality.

Figure 14 - Ethnicity breakdown of cases closed by CDOPs

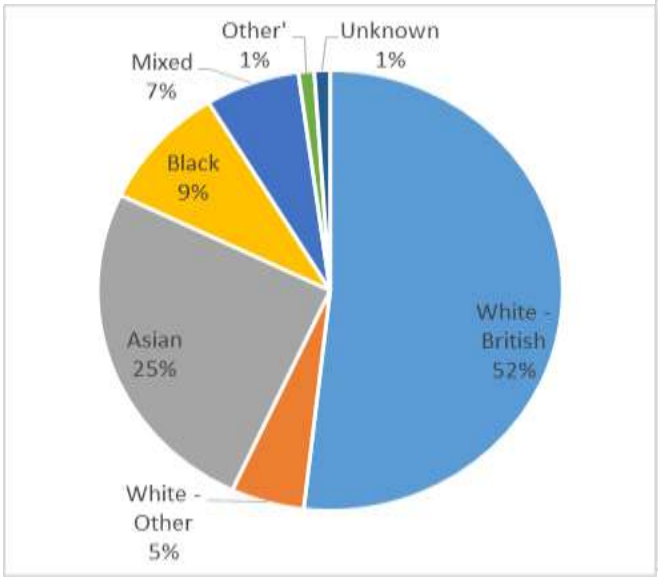
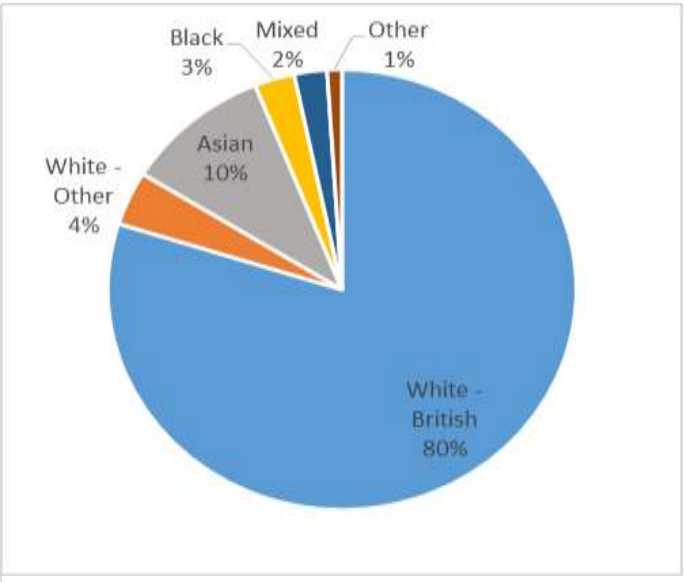


Figure 14 - GM ethnicity breakdown-- all ages, from 2011 census



[17] Source: ONS Census data, 2011 applied to 2016 mid-year population estimates

It is useful to compare national infant mortality rates (per 1000 live births to mothers of that ethnicity) for some of these ethnic groups, taken from ONS birth statistics from 2013[18]. This shows that some ethnic groups experience high infant mortality rates, even taking account of any difference in birth rates.

Figure 15- infant mortality rates by ethnicity, 2013

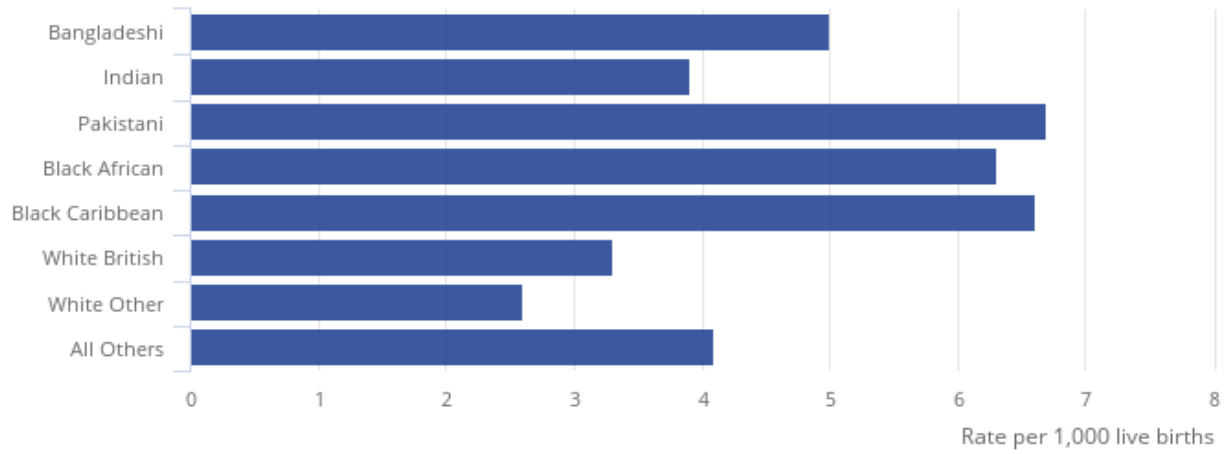
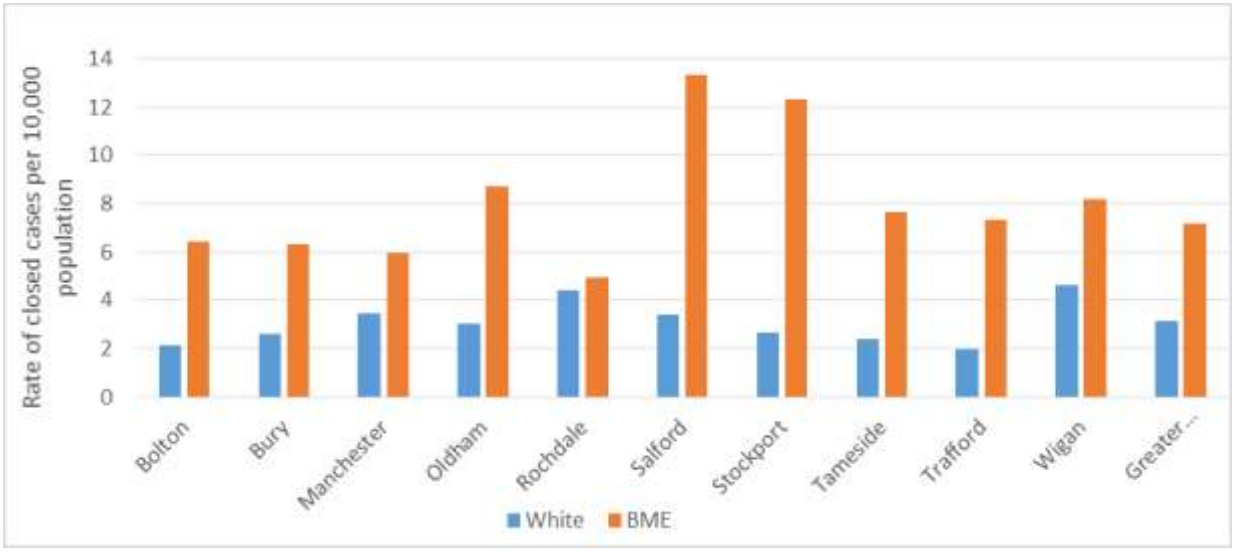


Figure 16 puts this in sharp relief for GM LAs, showing the difference between the rates of deaths for each ethnic grouping in each LA, taking account of the size of each population group. In individual LAs the numbers are small and the significance of the difference could be heavily influenced by one or two cases. However, the consistency of this effect across areas and with national rates, and the size of difference when looking at all GM cases shows a true inequality where people of non-white British ethnicity are at increased risk. Minority ethnicity correlates with socio-economic deprivation which may explain much of the differences and there are differences between the different ethnic groups in terms of average deprivation and mortality rates, as above. For example, a smaller proportion of Chinese and Indian children claim Free School Meals (one measure of deprivation) than White British children, with a larger proportion again within 'other Asian' or Black communities[19]. Now that data is being recorded in more detail on ethnicity, further analysis of the interaction between ethnicity and deprivation may be helpful in future.

Figure 16 - Difference in rates (per 10,000 population) of closed cases for white and BME populations



[18] Source: ONS, Pregnancy and ethnic factors influencing births and infant mortality: 2013. Available here: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/pregnancyandethnicfactorsinfluencingbirthsandinfantmortality/2015-10-14#ethnicity

[19] DfE, Ethnicity, deprivation and educational achievement at age 16 in England: trends over time. June 2015.

Table 7 shows the breakdown by ethnicity in the cause of death assigned by the CDOPs. BME groups are over-represented in most categories of death this year, except deliberately inflicted injury, suicide, infection and 'sudden, unexpected, unexplained death'. The figures for cause of death broken down into more detailed ethnicity categories would be too small for one year but over time this may be a useful insight into whether certain ethnic groups are more vulnerable than others to particular causes of death. Consanguineous parents are known to increase the risk of congenital abnormalities[7], so it is probable that communities where cousin marriages are more common may suffer a disproportionate number of deaths from these causes but given the complexities around identifying who those groups are as a baseline, and taking into account deprivation, this requires more in-depth work with several years' worth of data for more meaningful analysis. As a snapshot, just under half of the deaths of Pakistani children closed this year (20 / 44) were due to chromosomal or genetic anomalies. 16 of these had consanguinity as a risk factor.

Table 7 - Cause of death by ethnic category

GM	White British	BME
1. Deliberate inflicted injury, abuse or neglect	100%	0
2. Suicide or Self-Harm	90%	<10%
3. Trauma and other External Sources	47%	53%
4. Malignancy	50%	50%
5. Acute medical/surgical condition	55%	45%
6. Chronic medical Condition	38%	63%
7. Chromosomal/ Genetic/ congenital	33%	67%
8. Perinatal/ Neonatal	56%	44%
9. Infection	75%	25%
10. Sudden Unexpected	74%	26%

3.8 Deprivation

Risk factors for many causes of child death have been shown to correlate with deprivation and inequality[20], including poor nutrition, maternal health including smoking rates, poor housing, parenting issues and lack of education. There are different measures of deprivation which might affect children. The Index of multiple Deprivation is a multi-factor model which has been used consistently across LAs and super-output-areas for many years allowing some comparisons so it is used here[21] but recognising that the experience of deprivation and poverty in different areas cannot be fully represented by any one measure.

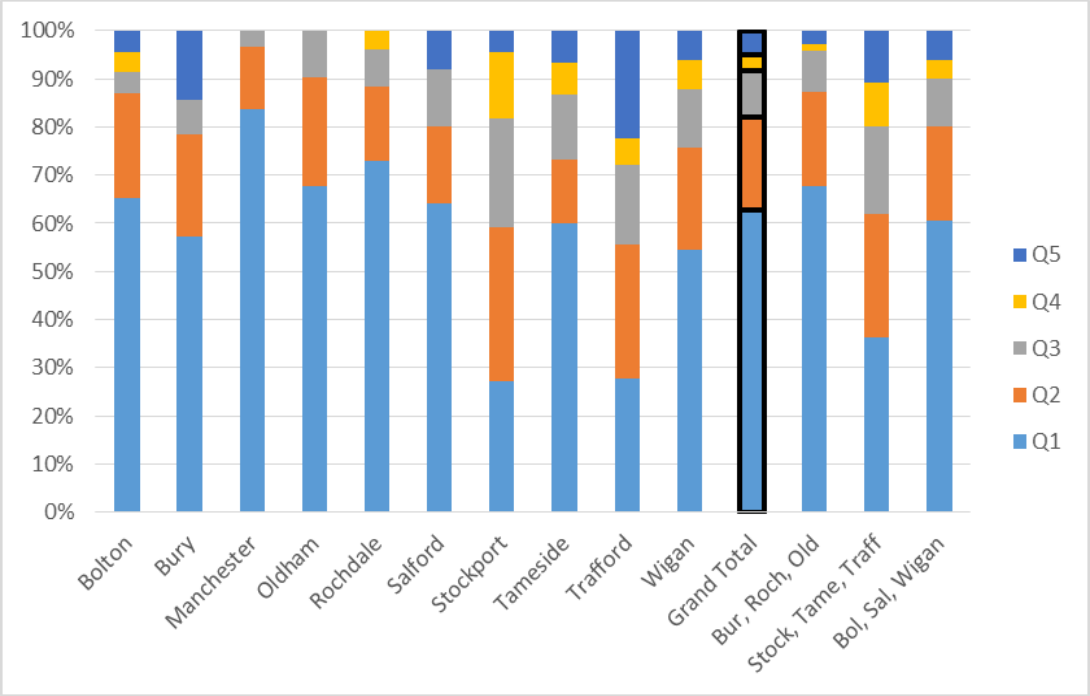
In Greater Manchester, 37% of the 0 to 18 population live in the most deprived 20% (quintile) of areas nationally but 61% of deaths were of children who live in this most deprived quintile, suggesting a significant increased risk. 19% of cases closed were for children who lived in the second most deprived quintile nationally, totalling 80% in these two quintiles. The trend for disproportionate numbers of child deaths in the two most deprived quintiles is replicated across GM to a greater or lesser extent. Stockport, Tameside and Trafford CDOP has a slightly lower proportion in the two most deprived quintiles but relative to the proportion of children living in those areas this is still disproportionately high. Manchester has the highest proportion of children living in

[20] Wolfe I, MacFarlane A, Donkin A, Marmot M, Viner R**.** *Why children die: death in infants, children, and young people in the UK - Part A.* London : RCPCH, NCB, BACAPH, May 2014. Marmot, M, Goldblatt, P., Allen, J., 2010, Fair Society Healthy Lives. See: http://www.instituteofhealthequity.org/

[21] CDOPs calculate an IMD score of a child's lower-super-output-area using the national postcode lookup tool (http://imd-by-postcode.opendatacommunities.org/). The corresponding national quintile for that score has then been calculated by dividing all national scores into 5 ranges (≤ 8.49 (Least deprived); Q2: 8.5 - 13.79; Q3 13.8 - 21.35; Q4 21.36 - 34.17; Q5 ≥ 34.18 (Most deprived)

poverty[22] and the highest IMD average score in GM (see Appendix 5) so you would expect a high proportion of deaths from the most deprived groups but 95% of deaths from the two most deprived quintiles is still disproportionately high and a significant inequality. Figure 17 below shows how cases closed from each LA are distributed across the national IMD quintiles.

Figure 17 - proportions of cases closed from each deprivation quintile (IMD)



4. Modifiable and other risk factors

In reviewing the death of each child to inform local learning, the CDOP is asked to "analyse any relevant environmental, extrinsic, medical or personal factors that may have contributed to the child's death… to determine different levels of influence (0-3) for any identified factors, as below:

0 - Information not available

1 - No factors identified or factors identified but are unlikely to have contributed to the death

2 - Factors identified that may have contributed to vulnerability, ill-health or death

3 - Factors identified that provide a complete and sufficient explanation for the death"[23]

The standardised analysis proforma (Form C) lists factors for consideration in four domains:

1. Child's Needs
2. Family and Environment
3. Parenting Capacity
4. Service Provision

CDOPs are subsequently asked to formally identify any factors they deem 'modifiable', defined as anything 'which may have contributed to the death of the child and which, by means of locally or nationally achievable interventions, could be modified to reduce the risk of future child deaths'. These can include the factors specified in the four domains, or any other factors the CDOP identifies. The most common factors identified as modifiable or as relevant are shown in Table 8 below and discussed in the following sections.

[22] PHE Fingertips, 2015, using data from HMRC regarding income. Measured as children in families where the income is <60% of the national median.

[23] Department for Education: Child death reviews: forms for reporting child deaths. Form C – Analysis Proforma. Available here: https://www.gov.uk/government/publications/child-death-reviews-forms-for-reporting-child-deaths

CDOPs must make a judgement call about whether a risk factor was relevant and to what extent it contributed to the death. For example, if the parents had a consanguineous relationship but the child died from a road traffic accident. This requires the Panel to make a judgement call, such as where there are risk factors such as domestic abuse but this has not occurred recently or the child died from an acute or chronic illness but where stress in the family may have reduced parental capacity to support the child's health. As such, a factor might be noted as present by CDOP but not relevant to the death (given a 1 in the above categorisation) or noted as contributing to vulnerability (i.e. given a 2) and may or may not be identified as a modifiable factor in that death. Equally it could be considered to completely explain the death (category 3) but not be considered modifiable, such as in some known life-limiting diseases.

Differences in factors identified between CDOPs or over time may be down to the approach taken to those kind of circumstances, recognition of a wider range of factors that contribute to deaths; asking for more / different information or being more aware of modifiable factors as evidence emerges. Less well-known or commonly identified factors may be relevant but may not routinely be picked up. For example, BMI of mother has only recently been recorded routinely by GM CDOPs as evidence has identified the risks that this brings to pregnancy and early life, but it is not requested by the national analysis proforma. Efforts are made to moderate decisions locally between GM CDOPs about which factors are felt to contribute to each child's death, so some analysis is appropriate at this level.

Without the narrative the data on modifiable and other features give only a broad picture of which risk factors are most prevalent but not how they are experienced or how they might be best modified to impact deaths. CDOPs discuss individual case details and can recommend actions to individual agencies or to their local LSCBs, on specific risks such as in service design or unsafe public spaces etc. This report provides an overview of features that are common in Greater Manchester which might allow some further work to be done on that footprint.

Of the 274 cases closed across GM in 2017/18 modifiable factors were identified in 110 (40%). That represents another increase from previous years from 24% in 2014/15. This is in keeping with the national trend, but GM is consistently above the national average for modifiable factors identified. As above, this may be Panel practice rather than systematic differences in GM cases.

These 110 cases included 175 identified modifiable factors, which have been grouped into the categories shown in Table 8, along with the number of cases where these factors were considered by CDOP to be relevant to the child's vulnerability or explaining the death (given a 2 or 3 on the above mentioned standard proforma). Some detail on these /linked risk factors are also recorded by GM CDOPs, such as whether parents were known to the Police and whether there was any statutory involvement with the family from social care (specifically whether a child protection plan or statutory order was in place). These are also referred to at relevant points in Table 8.

Table 8 - frequency of modifiable and other risk factors identified in CDOP closed cases

Issue	Cases with potentially modifiable factors identified	Cases with potential risk factors (relevance 2) or explanation for death (relevance 3)	Discussion or notes
Smoking (either during pregnancy or in household)	**45**	92 50 in household 42 in pregnancy	Includes maternal smoking in pregnancy, parental smoking and other household smoking
High BMI (obesity)	**37**		Maternal obesity recorded in 108 cases but categorised as relevant to the cause of death in 37 cases
Alcohol / Substance misuse by parent / carer	**13**	18	Some data relates to historical alcohol/substance misuse by the parent/carer
Access to / quality of health and/or care	**14**	21	Refers to issues in relation to service provision and/or uptake
Unsafe sleeping	**11** 7 co-sleeping 4 environmental	7	Profoma records the relevance of co-sleeping although other unsafe sleeping practices have been noted
Consanguinity	**7**	20	In total, consanguinity is present in 37 cases (13.5%) but relevant to the cause of death in 27 cases
Poor parenting/ child abuse / neglect* see below for more	**5**	30	Statutory status of child or siblings noted – see table 10
Domestic Abuse	**4**	8	In total, DA recorded in 55 cases though some data relates to historical incidents
Housing issues	**2**	9	Includes over-crowding, damp, dirt, chaotic lifestyles, repeat moves
Parental health or learning disability	**6**		In total, noted 100 issues relating to Mother or father but deemed relevant in 6 cases
Parental emotional / behavioural / mental health	**2**	53	In total, noted for in 61 cases for mothers and 23 cases for father
Additional contextual factors noted by GM CDOPs:			
Child emotional / behavioural / mental health		10	One case the relevance was categorised as ‘3’
Alcohol / Substance misuse by child		7	One case the relevance was categorised as ‘3’
Acute / sudden onset of illness		218	216 cases categorised as ‘3’, as at point of death there is usually a medical cause, though other factors increase vulnerability
Chronic illness		120	Categorised as ‘3’ in 1 Asthma, 1 Epilepsy and 62 other chronic condition
Child’s disability		20 Learning 25 Motor 14 Sensory 24 Other disability or impairment	No cases categorised as a ‘3’

4.1 Smoking in the household / pregnancy

Smoking is associated with worse outcomes in pregnancy for mother and child. The Royal College of Physicians[24] reported an increased risk of complications in labour, as well as an increased risk of miscarriage, still birth, low birth-weight and sudden unexpected death in infancy. Maternal smoking is estimated to increase infant mortality by approximately 40%[25]. It is known to contribute to longer term chronic and acute respiratory and cardio-vascular diseases.

Public Health England (PHE) uses smoking at time of delivery (SATOD) as a national measure of smoking in pregnancy. Figures for 2016/17[26] show an average SATOD for England of 10.7%. In GM, the average is 12.5%. 7 out of 10 LAs have rates above the national average, two have similar rates and only Trafford is significantly lower. It is notable that the highest rates of smoking in pregnancy are not in the most deprived areas of GM so there may be some learning about reducing smoking rates, or there may simply be less of a direct relationship with deprivation than there used to be.

Smoking in the household is also known to affect short and long-term health of children (and parents which in turn impacts children). Children who live in a household where one person smokes are more likely to develop asthma, chest infections, meningitis, ear infections, coughs and colds and it can exacerbate existing conditions and allergies. Anyone breathing passive smoke is at increased risk of smoking diseases such as lung cancer and heart disease[27]. Most LAs have seen their rates of smoking decrease over recent years, with notable exceptions (see Fingertips Tool for individual area analysis[20]).

For 2017/18 smoking was deemed to be a relevant risk factor (code 2) in a total of 52 cases (19%) but in no cases was it categorised as a '3' – i.e. providing sufficient explanation for the death. In 45 of these closed cases, smoking was deemed to be a modifiable factor which might have impacted the death. This includes 38 infants under one (21% of closed cases in this age group). Table 9 shows the proportion of infant deaths where smoking was deemed to be a relevant factor (code 2 or 3) and SATOD rates for each LA for comparison.

Table 9 - Smoking relevance to child deaths (closed cases) in infants under 1 year old

Local Authority	Smoking identified as a factor that may have or did contribute to the death (2 & 3)	Smoking at time of delivery %
Bolton	36%	13.2
Bury	22%	11.6
Manchester	17%	11.6
Oldham	18%	13.3
Rochdale	29%	16.3
Salford	28%	12.8
Stockport	6%	10.8
Tameside	33%	15.4
Trafford	8%	6.4
Wigan	29%	14.9
Greater Manchester	21%	12.5

[24] J R Coll Physicians Lond. 1992 Oct;26(4):352-6. Smoking and the young
[25] NICE Guidance PH26 (2010) Smoking: stopping in pregnancy and after childbirth. https://www.nice.org.uk/guidance/ph26/chapter/2-public-health-need-and-practice
[26] http://fingertips.phe.org.uk/search/smoking
[27] NHS Choices. Available here: https://www.nhs.uk/live-well/quit-smoking/passive-smoking-protect-your-family-and-friends/

4.2 Raised BMI

Statistics on obesity in pregnancy are not routinely reported in England. However, obesity data are available for women aged 16-44, which is broadly representative of child-bearing age. Between 1994 and 2014, the proportion of this group who were overweight (Body Mass Index or BMI 25-29) rose from 19.5% to 21.2% and the proportion who were obese (BMI >30) from 7.8% to 12.9%.36 Being overweight or obese in pregnancy increases the risk of both stillbirth and death in infancy, although the biological mechanism is unknown.26[28,29].

Data on maternal BMI for all cases where the child was aged less than 1 year has now been collected for 2 years by GM CDOPs. It was also agreed that any case where maternal BMI is >30 should be considered as a modifiable factor in cases categorised as Perinatal/neonatal deaths.

In 2017/18 there were 37 cases (13.5%) where maternal obesity was identified as a modifiable factor, which is an increase from the 10 cases last year and still second only to smoking as a leading modifiable factor in GM. It is not yet requested on the national proforma so it is not given a 1, 2 or 3 code in each case but GM CDOPs noted high BMI in 108 cases (39% of all closed cases). This is a very high rate and although it is noted as modifiable (therefore relevant) in only 37 cases, this rate of obesity is high.

Given that there are rising rates of obesity nationally and across GM, it is important that this data continues to be gathered in future years so that the trend can be monitored and used to make the case for maternal health promotion.

4.3 Consanguinity

In 2015/16 it was agreed by GM CDOPs that consanguinity (blood-relationship between parents – typically first or second cousins) would be considered as a modifiable factor if a second child is born with genetic anomalies to consanguineous parents, to standardise how different CDOPs recorded this data. Consanguinity was recorded as a relevant risk factor in 20 cases, of which 7 cases identified it as a modifiable factor under the definition above (2.6%). In 3 cases, consanguinity was considered to provide sufficient explanation of the death (category '3').

In total, GM CDOPs noted consanguinity as present in 37 cases closed (i.e. 17 cases in which it was present but not considered relevant to the cause of death). This is 13% of total child death cases. This is a high rate of consanguinity even if a large proportion were not deemed relevant. Without a robust baseline on numbers of children born to consanguineous parents, though, it is not possible to say for certain that this shows over-representation amongst these families, but it is unlikely that 13% of the GM population practice cousin-marriage. Equally, fewer than half of the deaths of Pakistani children, who are significantly over-represented compared to the general population, note consanguinity as a risk factor so other factors must also be considered for high rates of child deaths in certain populations and particularly high rates of congenital anomalies, including different cultural attitudes to screening and termination of pregnancy[30,31], although screening only identifies a small number of anomalies, some of which aren't fatal so this does not appear to fully explain the difference and death rates are high even taking into account live birth rates. Some groups, such as women who are born outside of the UK, may experience additional barriers to accessing antenatal care and education and so may miss out on measures such as folic

[28] Parliamentary Office of Science and Technology, 2016, Infant Mortality and Stillbirth in the UK. Available at: http://researchbriefings.files.parliament.uk/documents/POST-PN-0527/POST-PN-0527.pdf

[29] Maternal obesity in the UK: findings from a national project (2010) UK. Centre for Maternal and Child Enquiries

[30] Hawkins, A., Stenzel, A., Taylor, J., Chock, V. & Hudgins, L. (2012) Variables Influencing Pregnancy Termination Following Prenatal Diagnosis of Fetal Chromosome Abnormalities. *Journal of Genetic Counselling.* 22(2) pp. 238-248

[31] Gil, M., Giunta, G., Macalli, E., Poon, L. & Nicolaides, K. (2015) UK NHS pilot study on cell-free DNA testing in screening for fetal trisomies: factors affecting uptake. *Ultrasound in Obstetrics and Gynecology.* 45(1) pp. 67-73. DOI: 10.1002/uog.14683

acid supplementation which can reduce the risk of some defects. Most importantly, communities that are known to practice cousin marriages (in some families) also tend to be more likely to live in deprived communities, increasing several risk factors.

Parents from all social groups require genetic counselling services to be widely available for couples with a family history or past history of pregnancy affected by congenital anomalies[32] so that they have the information and support they need to plan their families. Work has been on-going in areas of GM where there are known to be some populations who practice cousin marriage and suffer higher than average rates of congenital anomaly and this should be evaluated to consider any effect on child deaths and disability, taking into account other factors in those families. The St Mary's Genetics Service are keen to work with partners to develop strategies for tackling this issue in GM.

4.4 Parental Alcohol/ Substance Misuse

Alcohol and/or drug use by parents was identified as a modifiable factor in 13 cases (just under 5%). It was also noted as a relevant risk factor in 18 cases, although never sufficiently explaining a death (category 3). It was also noted by CDOPs as present in a much larger group of cases in mothers and/or fathers. These may be historical case notes so may not reflect current risks, hence focus on those given a '2' for relevance. Parental drug or alcohol use can put pressure on a child and family in terms of caring or financial impact and increases the likelihood of children also misusing drugs or alcohol. Relatively small numbers here hide this wider impact on children's life chances but in terms of direct impact on child deaths, it is associated with higher rates of sudden unexplained deaths in childhood, particularly when co-sleeping.

4.5 Unsafe sleeping

Previously there has been a focus on co-sleeping but there were also several cases where other 'unsafe' sleeping practices were identified (sleeping on sofas or environments where babies can over-heat or experience suffocation risks). Unsafe sleeping of any kind was identified as a modifiable risk factor in 11 cases (4%), with 7 cases referring to co-sleeping and 4 to the sleep environment. GM CDOPs also specifically record overheating risks, noted in 5 cases. It was not identified as fully explaining the death in any case (code 3) which may represent the fact that co-sleeping is often recorded as a possible risk in unexpected, sudden deaths in infancy or childhood but the actual cause / mechanism of the death is often not ascertained. There has been no significant change in these figures over recent years.

4.6 Domestic Violence

In rare but tragic cases, domestic violence can be a direct factor in a child's death. However, more frequently, CDOPs note domestic abuse within families where it is not directly implicated. In GM domestic violence and abuse was deemed a modifiable risk factor in 4 cases (1.5% of closed cases for 2017/18); similar to last year, with reductions in the years before that. It was identified as relevant (but not modifiable in that case) in another 4 (code 2) but was noted in the records of 55 families in total (20%) which is in line with NSPCC estimates of exposure of children in the general population. In some of the 55 cases, the domestic abuse noted may be historical or not related to the current family structure.

4.7 Access to Appropriate Health / Social Care

Access to appropriate health or social care was identified as a modifiable factor in 14 cases, with issues cited (in brief notes only in the database) with small numbers of cases citing language barriers, provision of services for parents with disabilities, seeking IVF abroad, medical / care

[32] **National Perinatal Epidemiology Unit.** The contribution of congenital anomalies to infant mortality. Oxford : University of Oxford, 2010. Inequaliites in Infant Mortality Project Briefing Paper 4.

failings and lack of uptake by parents, including late booking. In several cases, the issue with healthcare services was related to access to appropriate care pathways for pregnant women with high BMI, including need for consultant-led care.

Prior medical / surgical intervention was identified in 8 cases and in 1 this was given a category '3'. From the dataset provided it is very difficult to assess the real issues in this category but individual CDOPs / LSCBs will have reviewed cases to identify any specific issues with local services.

4.8 Parental Health (physical health, learning disability, emotional / behavioural / mental health)

The official Form C analysis proforma only asks CDOPs to record and categorise where emotional / behavioural / mental health are involved in a case and the relevance of this. It does not include where parents have physical health issues or disabilities, but GM CDOPs helpfully record this separately (although not the 'relevance' classification) so it is included in the table above as a separate line. A parent's short or long-term physical or mental health issues or their physical or learning disability can have a direct impact on them and their family, if not appropriately supported, so there are implications for how services work together and support vulnerable families.

In 6 cases, parental physical health or learning disability were noted as modifiable factors in a child's death and in 2 cases parental emotional health was identified as a modifiable factor. CDOPs additionally noted parental physical health /learning disability issues present for the mother in 77 cases and for the father in 23 cases, with only a small amount of overlap in families. The majority of these referred to physical health issues and this is a high rate compared to the general population, although details of these needs are not clear from the database. For emotional / behavioural / mental health, relevance data is available, showing 53 cases where this was relevant or directly responsible for the death of the child (given a '2' or '3'). Notes shared with CDOP may refer to historical issues, so it is most informative to look at those where the risk factor was given a 2 or 3 so it may be worthwhile CDOPs recording relevance for factors which are not on the proforma (such as parental physical health / learning disability). This might be an area warranting further analysis in the upcoming 5 year in-depth study, drawing on original data sources, especially given the wide spectrum of issues covered here and the implications for many different partners therefore.

4.9 Statutory intervention

GM CDOPs note some additional information about social care and police involvement with the family, in the form of the categories shown in Table 10 (this does not include families that are 'known' to social care for any other reason / level of need). Although this does not provide detail about relevance in the case and some notes are about historical involvement, this is a high level of involvement from statutory agencies, given that most deaths are not attributed to specifically social causes. Further analysis of this information to identify most relevant or recent involvement and definition of 'known to Police' may prove useful.

Poor parenting / child abuse / neglect was identified as modifiable factor in 5 cases but also as a relevant factor in 30 cases (11%), with 18 referring to poor parenting and 12 to child abuse or neglect. Even removing those cases where one or both parents were known to the police, 94 cases involve reference to child protection plan or statutory order in the family (child or sibling and current or previously).

Table 10 - Social care involvement in cases

*Statutory agency involvement	No. of cases	Notes
Child subject of Child Protection Plan (CPP)	14	10 'previously' and 4 at time of death
Child subject of a Statutory order	9	4 'previously' and 5 at time of death
Sibling subject of CPP	15	Excluding those where child themselves was on a CPP - i.e. additional 15 families
Sibling subject of a statutory order	64	Excluding those where child themselves was subject of an order- i.e. additional 64 families
TOTAL	252	There is overlap in cases but in total, 138 cases (about 50%) have at least one of these issues identified.

4.10 Emotional, Behavioural and Mental Health of the Child

The emotional, behavioural or mental health of the child is collected by CDOPs and scored in terms of relevance in each case. It was recorded as having contributed to or fully explaining (category 2 or 3) the death of 10 children whose cases were closed in 2017/18. In one of these cases it was given a '3' indicating that it directly explained the death. 8 of these were categorised as deaths due to suicide or deliberate self-harm but the other two children experiencing mental ill health were classified as having suffered an acute medical condition or sudden, unexpected death. Very little information is available on the database about the circumstances surrounding these deaths. A thorough review of suicides is conducted regularly both nationally and locally. CDOPs and LSCBs should continue to contribute to these as necessary and reflect on any outputs when forming local action plans.

In total, 10 deaths were attributed to suicide or deliberate self-harm although emotional or behavioural health was only noted as contributing to the vulnerability of the child in 8 of those cases (as above). In the other two cases information may have been missing or simply no evidence of previous issues although it is likely if a case is investigated by the Coroner and reviewed by the CDOP and the conclusion is that the cause of death was suicide then the child was experiencing some mental or emotional ill-health, even if only immediately before the death occurred and without anyone else being aware.

It is also likely that mental ill-health was experienced by other children whose deaths were reviewed this year, even if it did not clearly contribute to the circumstances of their death, as this information may not have been known to agencies involved in the review; if it was known to anyone at all.

In any case, these 10 cases alone represent a tragic set of missed opportunities to prevent death and family devastation and the narratives from the CDOP reviews suggest that in some cases, access to services and understanding of referral pathways between agencies were an issue. In most cases a complex set of circumstances surrounded the death and no one clear action could be identified that would have changed the outcome but modifiable factors were identified in 8 of the 10 cases and these should be reviewed as a priority to avoid any child feeling they wish to take their own life.

5 Recommendations

The following should be considered by each CDOP and their respective LSCBs and any relevant GM groups:

1. Research is being commissioned to look at CDOP data for the 5 years that it has been consistently collected (2013-2018), to further analyse trends and reduce the effect of random variation.

2. GM CDOPs should consider any emerging evidence from other areas and from international research to identify any risk factors which have not received the focus that others have, including areas for future data collection and analysis. In particular, it may be worthwhile recording the relevance (1,2,3) for factors which are not (yet) on the national data analysis proforma but which CDOPs currently record, such as high BMI of mother and physical health or learning disability.

3. Close cooperation and moderation between the 4 CDOPs in GM has improved data quality and allowed for analysis across GM on emerging issues such as maternal obesity and consanguinity. This close co-operation and moderation should be recognised and continue, particularly in risk factors that newly emerge and / or are not included in standard national proformas. This will give credence to this combined GM analysis and allow more reliable comparisons and identification of trends.

4. Children under the age of 1 year old are the most vulnerable to childhood deaths by a considerable margin both in GM and nationally, with rates in GM worse than the national average. With rates locally and nationally stagnating and possibly beginning to increase, all LSCBs should review local sector led improvement (SLI) plans agreed following the GM CDOP / Public Health Conference in November 2017 and last year's annual reports.

5. Health inequalities in the distribution of child deaths remain a concern. The BME population remains at increased risk of childhood mortality and further analysis should be conducted to look at the more granular population breakdown to compare to the categories now collected by CDOPs and assess which populations in particular appear to be over-represented in order to consider how this might be targeted. The improvements in collecting of ethnicity data by CDOPs should be recognised as significantly assisting in targeting safeguarding efforts.

6. The proportion of deaths in the most deprived group appears to have fallen again this year with a corresponding increase in deaths from the second most deprived group. This needs further analysis to assess whether this is a true trend and if so, whether it is the result of positive service or community improvements (with negative or at best no effect for those in the 2nd most deprived quintile) or population / demographic changes or an artefact in the data or random variation for the last 2 years.

7. As in previous years, smoking remains a key modifiable factor for child deaths across GM, with the proportion of cases where smoking is identified as a relevant factor higher than the rate of smoking in pregnancy. This has been recognised in the Greater Manchester Population Health Plan which is putting in place a GM evidence-based approach to reducing smoking, particularly in pregnancy. CDOP data and action plans should be linked to this and allow an opportunity to review the impact of smoking on deaths through the in-depth CDOP review process.

8. Some research into consanguineous practices amongst the general population would be useful to provide a baseline to assess to what extent deaths are over-represented amongst parents who are blood-relatives. This must take into account birth rates, access to antenatal care and deprivation to consider how much of the increased risk of death is attributable to consanguinity. Joint work with the lead geneticists in this area and linking with national / regional strategies to support families where there is a known risk will be important, using this data-led approach. The data recording may need to be tweaked slightly to ensure accurate recording of the nature of relationships to allow comparisons but this would add crucial information to any case for work in this area.

9. GM CDOPs collect data on maternal BMI, despite the national analysis proforma not requesting it. This has enabled them to identify a significant risk factor which appears to be over-represented amongst child deaths and was identified as modifiable factor in some cases due to a direct relationship with the cause of death. Given this dataset, GM should lead the way nationally in identifying where the most impact could be made on these types of deaths by analysing those cases further. In particular, health/care pathways were identified as a missed opportunity to change outcomes for the families and this should be reviewed now by all areas. Reduction in obesity in women of childbearing age prior to conception is clearly the longer-term goal for all partners and these figures on child death risks make the case for investment in this area.

10. A number of cases (34%) had reference to some involvement by social care in terms of the child themselves or a sibling being subject to a child protection plan or statutory order. Some families also had information recorded about Police contact at that time but also historical involvement. The data available for analysis does not provide enough detail to say whether there were any opportunities for improving the outcomes for these children or whether these interventions were effective at safeguarding the child until the natural end of their life from a known life-limiting disease. Individual CDOPs and LSCBs already consider the best way to learn lessons from cases where abuse or neglect may have been a factor and/or when agencies have been involved with the child.

Appendix 1 - Summary of Child Deaths – Cases Closed by CDOPs in GM

Characteristic	Number					Proportion				
Age	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**
0-27 days	89	109	90	125	123	41.7%	41.6%	38.1%	53.5%	45%
28-364 days	48	60	62	36	54	22.2%	22.9%	26.3%	14.9%	20%
1-4 years	26	25	25	13	34	12.0%	9.5%	10.6%	5.7%	12%
5-9 years	19	17	15	13	18	8.8%	6.5%	6.4%	6.6%	7%
10-14 years	20	24	23	19	15	9.3%	9.2%	9.7%	9.6%	5%
15-17 years	13	27	21	22	30	6.0%	10.3%	8.9%	9.6%	11%
Total Closed cases	**215**	**262**	**236**	**228**	**274**					
Sex										
Male	110	155	138	115	157	51%	59%	59%	50%	58%
Female	104	107	97	112	115	48%	41%	41%	49%	42%
Indeterminate	<5	0	0	<5	<5	<5%	0%	0%	<5%	<5%
Ethnicity										
White/White British	128	156	137	136	142	60%	60%	58%	57%	52%
BME	79	105	98	88	132	40%	40%	42%	39%	48%
Not Known/ Input	8	1	0	4	0	4%	<1%	0%	2%	0%
Deprivation Quintile										
1 (Most Deprived)	*45*	149	139	64	168	*21%*	57%	59%	28%	61%
2	*19*	44	36	58	52	*9%*	17%	15%	25%	19%
3	*12*	27	26	42	26	*6%*	10%	11%	18%	9%
4	*14*	19	19	33	9	*7%*	7%	8%	14%	3%
5 (Least Deprived)	*14*	19	15	26	13	*7%*	7%	6%	11%	5%
No data available	*111*	4	0	5	6	*52%*	2%	0%	2%	3%

Appendix 2 – Category of death by number and percentage for 2012/13 - 2017/18

Form C Category	2012/2013		2013/2014		2014/2015		2015/2016		2016/2017		2017/18	
1. Deliberately inflicted injury, abuse or neglect	<5	1%	<5	1%	5	2%	0	0%	0	0%	<5	<1%
2. Suicide or deliberate self-harm	11	4%	<5	2%	9	3%	7	3%	6	3%	10	4%
3. Trauma and other external factors	10	4%	10	5%	14	5%	15	6%	8	7%	15	5%
4. Malignancy	12	4%	20	9%	18	7%	15	6%	18	6%	20	7%
5. Acute medical or surgical condition	16	6%	20	9%	9	3%	12	5%	11	5%	11	4%
6. Chronic medical condition	11	4%	12	6%	10	4%	11	5%	7	5%	16	6%
7. Chromosomal, genetic and congenital anomalies	70	26%	50	23%	68	26%	56	24%	60	24%	67	24%
8. Perinatal/neonatal event	97	37%	81	38%	97	37%	78	33%	93	33%	102	37%
9. Infection	18	7%	5	2%	12	5%	18	8%	7	8%	12	4%
10. Sudden unexpected, unexplained death	20	7%	10	5%	19	7%	24	10%	16	10%	19	7%

Appendix 3 - Greater Manchester population aged under 18 years by CDOP area and LA

Number of children aged under 18 years in each area of GM and its overseeing CDOP (ONS 2016 MYE Data)	
CDOP	**Under-18 Population Size**
Bolton, Salford & Wigan	**189,634**
Bolton	66,918
Salford	54,881
Wigan	67,835
Stockport, Tameside & Trafford	**166,675**
Stockport	62,372
Tameside	49,349
Trafford	54,94
Bury, Rochdale & Oldham	**153,144**
Bury	42,879
Oldham	58,802
Rochdale	51,463
Manchester	**119,825**
Greater Manchester	**629,278**

Source: ONS 2017

Appendix 4 - Ethnicity

We can use ethnicity estimates from the 2011 census and apply these to the 2016 mid-year population estimates for each local authority to estimate the breakdown of the under 18 population by ethnicity. This shows that six of the local authorities in GM have a lower proportion of the population that identify as White British than the North West average. Manchester has the lowest percentage White British population (see table 2 below).

Estimated under 18 years population by ethnic group for GM local authorities, mid-2016 population data applying 2011 census ethnicity breakdown (source ONS)

Area	White British		BME	
Bolton	46,759	69.9%	20,255	30.2%
Bury	34,557	80.6%	7,871	18.6%
Manchester	54,842	45.8%	71,844	56.7%
Oldham	35,898	61.0%	21,753	37.7%
Rochdale	36,030	70.0%	16,229	31.1%
Salford	43,851	79.9%	9,013	17.0%
Stockport	52,808	84.7%	8,098	13.3%
Tameside	41,360	83.8%	7,828	15.9%
Trafford	40,226	73.2%	13,612	25.3%
Wigan	65,115	96.0%	3,661	5.3%
Greater Manchester	451,446	71.5%	180,164	28.5%
North-West	1,282,511	84.3%	238,854	15.7%

Source: ONS 2016

Appendix 5 - Index of Multiple Deprivation (IMD)

The IMD data has not been updated, so the scores from 2015 remain the same. For GM 6 out of the 10 LAs have higher IMD scores than the North West average, i.e. are more deprived than the average. These LAs also have a higher proportion of their population living in the most deprived areas of the country than the North West average (see table 3). On this measure Manchester ranks as the most deprived LA in GM with Trafford the least, with 41% and 3% of their respective populations living in the most deprived areas of the country. In Greater Manchester as a whole, 21.6% live in the most deprived 10% nationally, equating to 599,952 people.

Average IMD 2015 score and percentage in the most deprived 10% for GM local authorities (source ONS)

Current Code	Former Code	Area	Average IMD 2015 score	% of people in an area in most deprived 10% nationally
E08000003	00BN	Manchester	40.51	41%
E08000006	00BR	Salford	32.95	29%
E08000005	00BQ	Rochdale	33.68	28%
E08000004	00BP	Oldham	30.29	23%
E08000001	00BL	Bolton	28.42	20%
E08000008	00BT	Tameside	29.38	17%
E08000010	00BW	Wigan	24.85	14%
E08000002	00BM	Bury	21.76	10%
E08000007	00BS	Stockport	19.10	9%
E08000009	00BU	Trafford	15.38	3%
-	-	North West	28.04	20%

Source: ONS, 2015