KENT PUBLIC HEALTH OBSERVATORY

Epidemiology of Traumatic Brain Injury in Kent and Medway

July 2020

Produced by

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Status: Approved

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1. Executive Summary

1.1 Introduction

Traumatic brain injuries (TBI) represent a significant public health problem in the UK and in Kent and Medway. This report presents the epidemiology of traumatic brain injury across Kent and Medway to provide the local context in terms of the scale of the problem and the need for public health intervention.

1.2 Key Findings

- Rates of TBI in Kent and Medway are consistent with European rates.
- TBI represents approximately 1% of all admissions (elective and emergency) to hospitals in Kent and Medway.
- A higher level of deprivation appears as a risk factor for TBI in Kent and Medway, both in terms of incidence (by initial admission) and for subsequent readmission.
- Male sex and older age both appear as risk factors for TBI in Kent and Medway.
- West Kent appears to have a significantly higher rate of TBI than the rest of Kent and Medway.
- White British people count for the majority of patients with TBI, but the incidence is highest is ethnic minorities in Kent and Medway.

1.3 Recommendations

- Consider developing public health initiatives to focus on the higher incidence of TBI in more deprived areas.
- Investigate the reasons why people suffering higher deprivation have higher readmission rates following TBI. Consider what discharge support could be added into the patient pathway to try and intercept this risk.
- Consider public health initiatives and messaging aimed at men (especially 15-25 years), who are at greater risk of a TBI.
- Consider the public health prevention initiatives in deprived areas, particularly around the risk factors for a TBI, such as drug and alcohol abuse.
- Undertake further investigation into why people of ethnic minorities are at a higher risk of TBI and consider developing public health initiatives to drive down the incidence.
- Consider public health initiatives and messaging in groups who work with older persons, as older persons have a higher incidence of TBI and a higher chance of a worse outcome.
- Consider the higher areas of TBI when citing preventative public health initiatives, with a view of deprivation and age structure of the population.
- Consider a further project investigating the link between TBI and violence in Kent and Medway.

2 Traumatic Brian Injury

2.1 The Background of Traumatic Brain Injury

2.1.1 Overview

Nationally there were 348,453 UK admissions to hospital with acquired brain injury in 2016-17. That is 531 admissions, on average, per 100,000 of the population. Acquired admissions in the UK have increased by 10% since 2005-6. Nationally, men are 1.5 times more likely than women to be admitted for head injury. However, female head injury admissions have risen 23% since 2005-6.[2] TBI is the leading cause of death and disability in people aged 1-40 in the UK[3].

People of all ages are potentially susceptible to a traumatic brain injury. However, it is a significant problem in older adults. Indeed, adults over 75 and older are reported to have the highest rates of TBI-related hospitalization and death. Older age is therefore recognised as an independent predictor of worse outcome.

Other risk factors for TBI in the general population include non-white ethnicity and male sex. There are few studies addressing these issues to date.

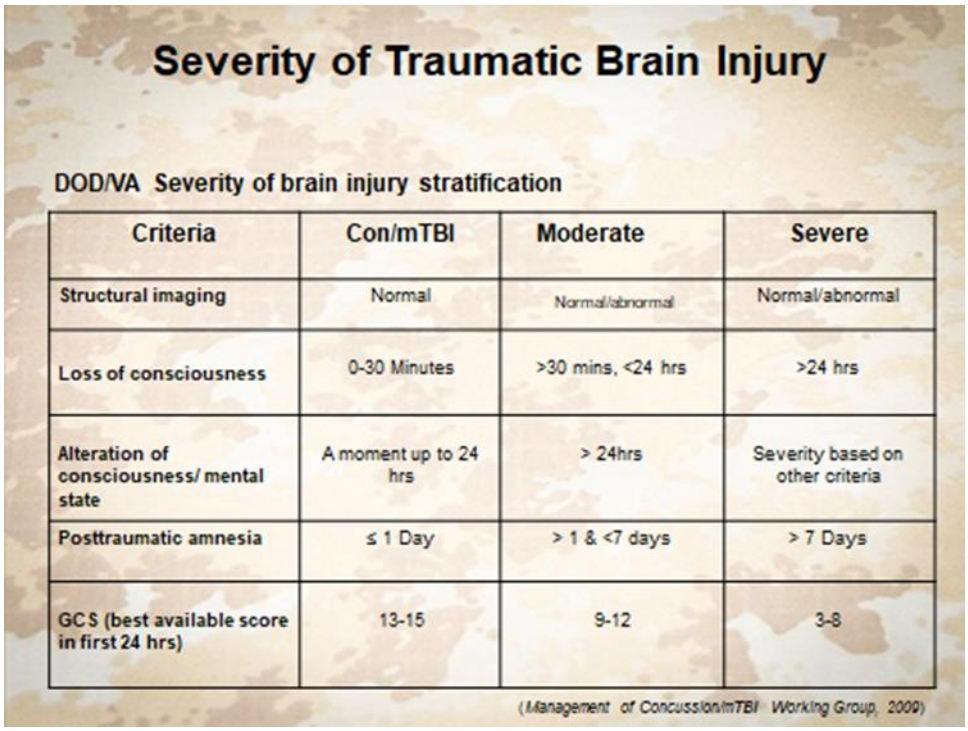
Consequences from traumatic brain injury do not park at the hospital exit; over a million people in the UK live with the consequences of TBI, at a cost to the economy of around £15 billion a year. There is a large range in severity of TBI, with about 85-90% classified as mild, and 10-15% as severe[4]. TBI is assessed as being severe, moderate or mild using the Glasgow Coma Scale, as well as other clinical parameters as set out in the chart below.

[2] https://www.headway.org.uk/about-brain-injury/further-information/statistics/

[3] Parsonage, Michael Traumatic Brain Injury and Offending. Centre for Mental Health P4 https://www.centreformentalhealth.org.uk/sites/default/files/2018-09/Traumatic_brain_injury_and_offending.pdf

[4] Parsonage, Michael Traumatic Brain Injury and Offending. Centre for Mental Health P4

Table 1:



Severity of Traumatic Brain Injury

DOD/VA Severity of brain injury stratification

Criteria	Con/mTBI	Moderate	Severe
Structural imaging	Normal	Normal/abnormal	Normal/abnormal
Loss of consciousness	0-30 Minutes	>30 mins, <24 hrs	>24 hrs
Alteration of consciousness/ mental state	A moment up to 24 hrs	> 24hrs	Severity based on other criteria
Posttraumatic amnesia	≤ 1 Day	> 1 & <7 days	> 7 Days
GCS (best available score in first 24 hrs)	13-15	9-12	3-8

(Management of Concussion/mTBI Working Group, 2009)

The effects of brain injury can be far-reaching and may be temporary or long term. They can be grouped into 3 lots[5]:

- Physical effects such as fatigue, impaired mobility, weakness/paralysis and speech problems
- Cognitive effects such as memory problems, impaired reasoning and reducing problem solving ability
- Emotional and behavioural effects such as personality changes, depression, anxiety and anger.

2.1.2 National picture – policies and NICE

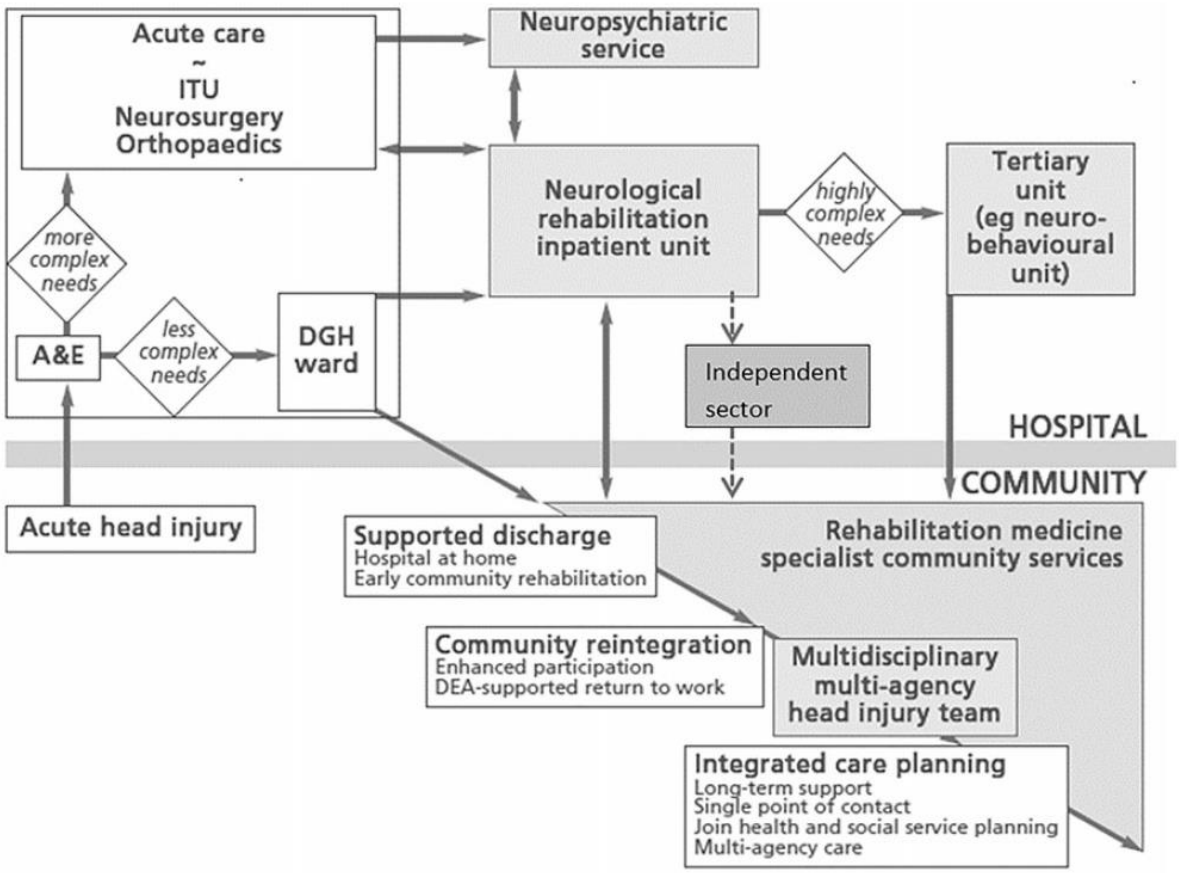
There is an applicable NICE Guideline *'Head Injury: assessment and early management clinical guideline*' [CG176] which was last updated in September 2019[6]. There is also a quality standard[7] that covers assessment, early management and rehabilitation following head injury in adults, young people and children. It describes high-quality care in priority areas for improvement.

[5] House of Commons, Acquired brain injury, debate pack. Number CDP 2019/0111, 8 May 2019

[6] Published date: January 2014 Last updated: September 2019

[7] https://www.nice.org.uk/guidance/qs74

Figure 1[8]: Specialist Rehabilitation in the Trauma Pathway – a model



Acquired brain injury has been discussed as an important issue at national government, with an All-Party Parliamentary Group chaired by Mr Bryant. Moreover, in September 2018, the group published a report *'Acquired Brain Injury and Neurorehabilitation, Time for Change'.* There was a debate held in the Commons Chamber on Thursday 9 May 2019.

2.1.3 Traumatic Brain Injury Research Background in Kent.

A Kent, Surrey and Sussex study confirmed that military veterans have a particular vulnerability for TBI.[9] It is suggested that the lifetime prevalence for 1 or more TBI in UK

[8] a. Collin C, Ward A B. 'Rehabilitation Medicine 2011 & Beyond'. RCP London. 2010
b. BSRM core standards for specialist rehabilitation, October 2014

[9] Large-scale surveys of US army combat brigades deployed to the Iraq Conflict report that 15% - 23% of soldiers sustained a mTBI (*Hoge et al., 2008; Terrio et al., 2009*).

military veterans is 72%.[10] Another Kent based study highlighted gaps for TBI service pathway despite having provision of a specialist hospital-based service.[11]

Both the above Kent studies were presented in the House of Commons meeting for brain injury service development which forms the impetus for this current comprehensive review of Kent & Medway County.

2.2 Methods

We used a range of data from Hospital Episode Statistics (HES) and the Kent Integrated Database (KID).

Please see Appendix A 4.1 for further detailed information on methodologies including coding.

Subsequent to data extraction, we applied various analytical and statistical methods to the data.

2.3 The Local Picture: Kent and Medway

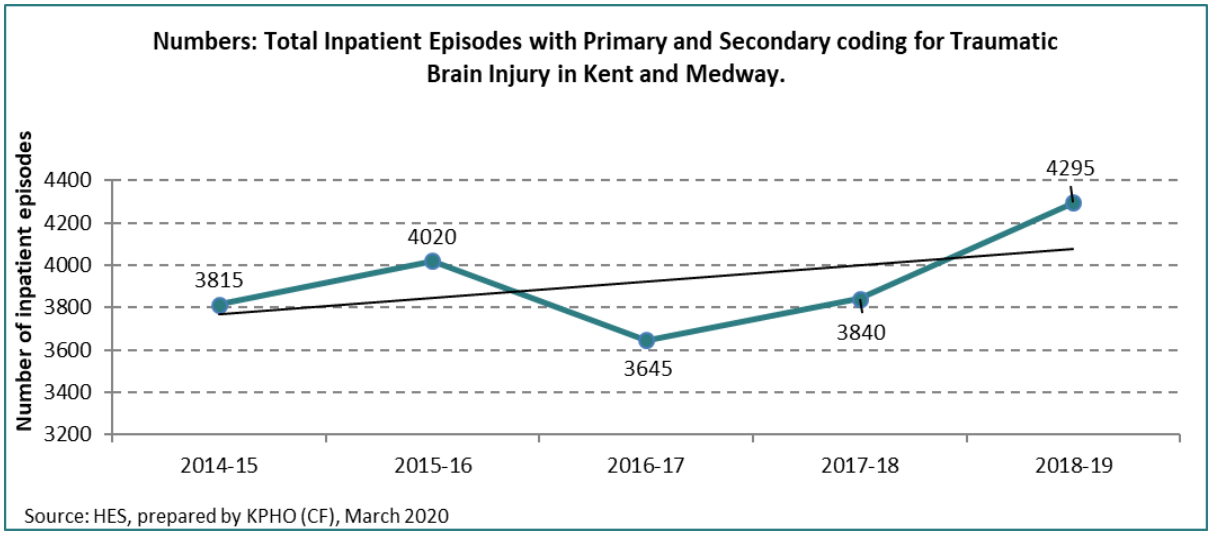
2.3.1 Numbers

Overall, the total number of inpatient episodes for TBI in Kent and Medway in 2018-19 was 4295 episodes - this represented 0.93% of total inpatient admissions. Therefore, nearly one in a hundred elective and emergency patients are being treated for TBI. However, these numbers are likely to represent the relatively more severe TBI, with the milder end of the spectrum not being counted. This is due to patients with milder head injuries not seeking any medical advice, or who only attend A&E or other urgent care or visit their GP – these numbers do not consider these cases.

[10] Neuropsychiatric Outcomes in UK Military Veterans With Mild Traumatic Brain Injury and Vestibular Dysfunction. JHeadTraumaRehabil, 2018, DOI:10.1097/HTR.0000000000000468 E Denby, D Murphy, W Busuttil, M Sakel, D Wilkinson

[11] V Abrahamson, J Jensen, K Springett & M Sakel (2017) Experiences of patients with traumatic brain injury and their carers during transition from in-patient rehabilitation to the community: a qualitative study, Disability and Rehabilitation, 39:17, 1683-1694, DOI: 10.1080/09638288.2016.1211755

Figure 2:



The above figure shows the percentage of traumatic brain injury admissions in relation to the total number of elective and emergency admissions for Kent and Medway. The percentage has stayed remarkably stable, hovering around the 0.9% mark, except for a dip in 2016-17 to 0.82%

Table 2:

	% TBI of elective & emergency admissions
2014-15	0.90
2015-16	0.93
2016-17	0.82
2017-18	0.86
2018-19	0.93
TOTALS	0.89

2.3.2 Age-standardised Rates

Age-standardised rates (ASRs) are a weighted average of the age-specific rates of TBI per 100,000, where the weights are the proportions of persons in the corresponding age groups according to the standard European population. This enables a comparison to be made across different populations, such as by locality.

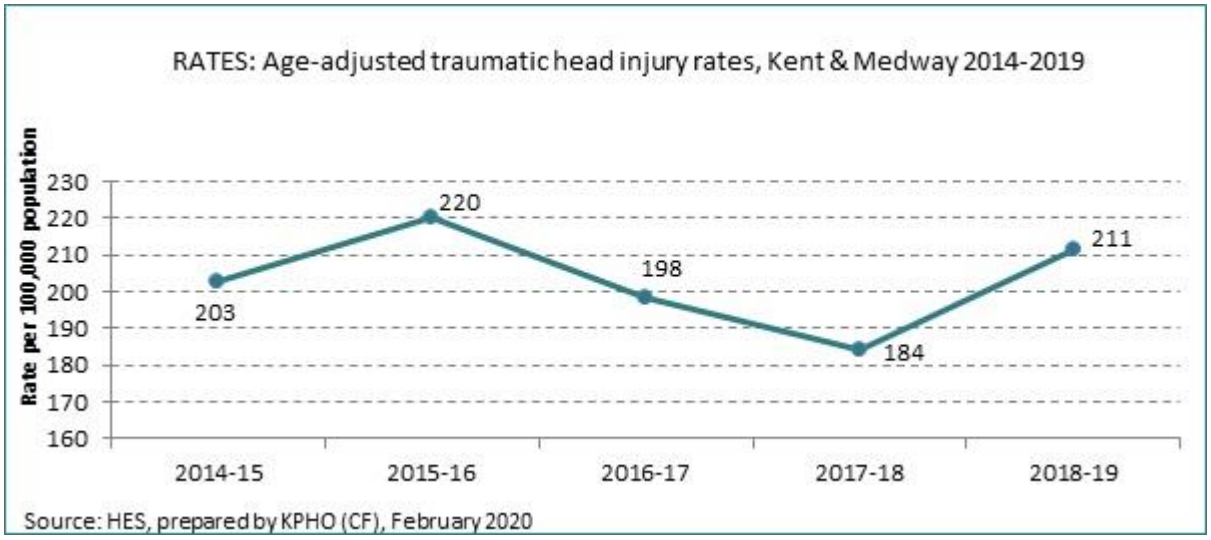
Across Europe it is estimated that the average incidence of TBI is 235 per 100,000, with most countries experiencing in the range of 150-300 per 100,000 per year[12].

Table 3: Age-Standardised Rates for Traumatic Brain Injury in the Kent and Medway population

Year	Age-standardised rate per 100,000 population
2014-15	203
2015-16	220
2016-17	198
2017-18	184
2018-19	211

The ASRs are within the expected range of TBI for Europe. This is likely an *underestimate* of total TBIs especially those on the milder end of the spectrum for reasons given in 2.1.3

Figure 3:



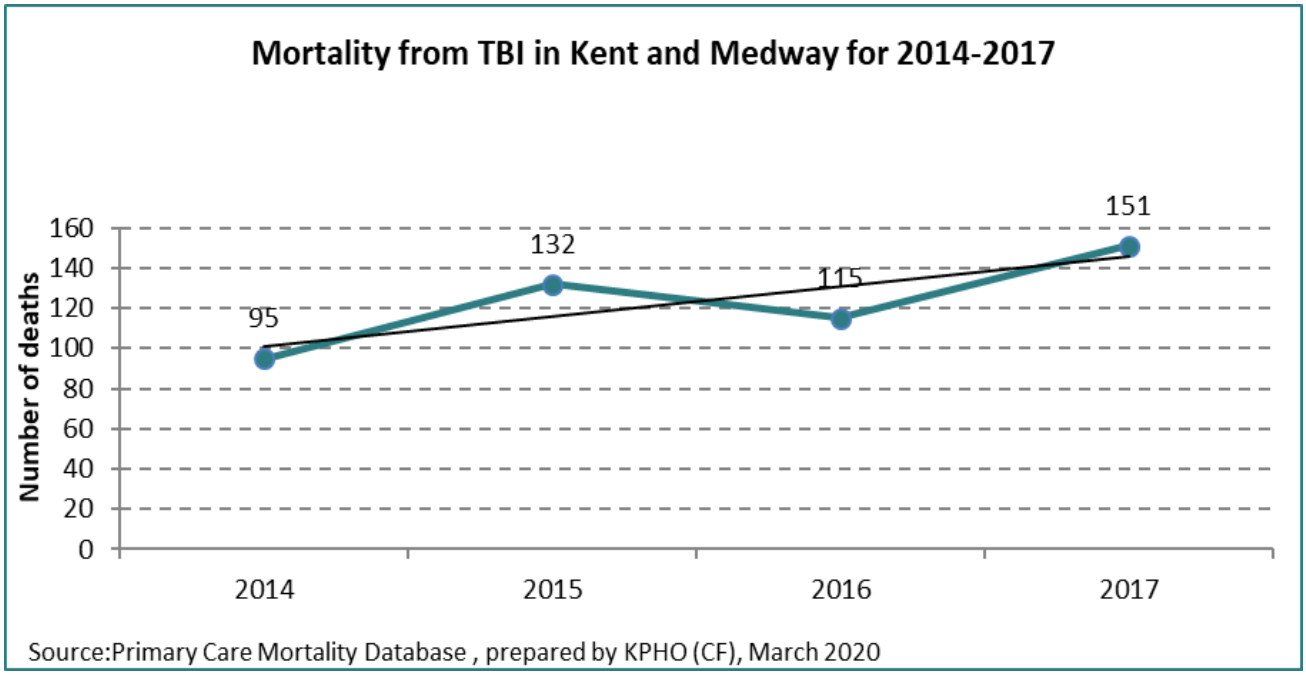
The age adjusted TBI rates for Kent and Medway do vary year on year, although are generally around the 200 per 100,000 population. The highest rate was at 220 per 100,000 in 2015-16 and the lowest in 2017-18 with 184 per 100,000.

[12] Tagliaferri F, Compagnone C, Korsic M, Servadei F, Kraus J: A systematic review of brain injury epidemiology in Europe. Acta Neurochir (Wien). 2006. 148: 255-258. 10.1007/s00701-005-0651-y

2.3.3 Mortality from TBI in Kent and Medway

Between 2014-2017 the total number of people who died after a traumatic brain injury was 493. Since 2014 the number of people dying from TBI has been increasing. This could be because we have an increasingly larger population of older people who we know are more susceptible to TBI. A further chart will look at age at death.

Figure 4:



In all year's men make up a higher number of deaths than women. This is to be expected as men are more likely to have a head injury.

Figure 5:

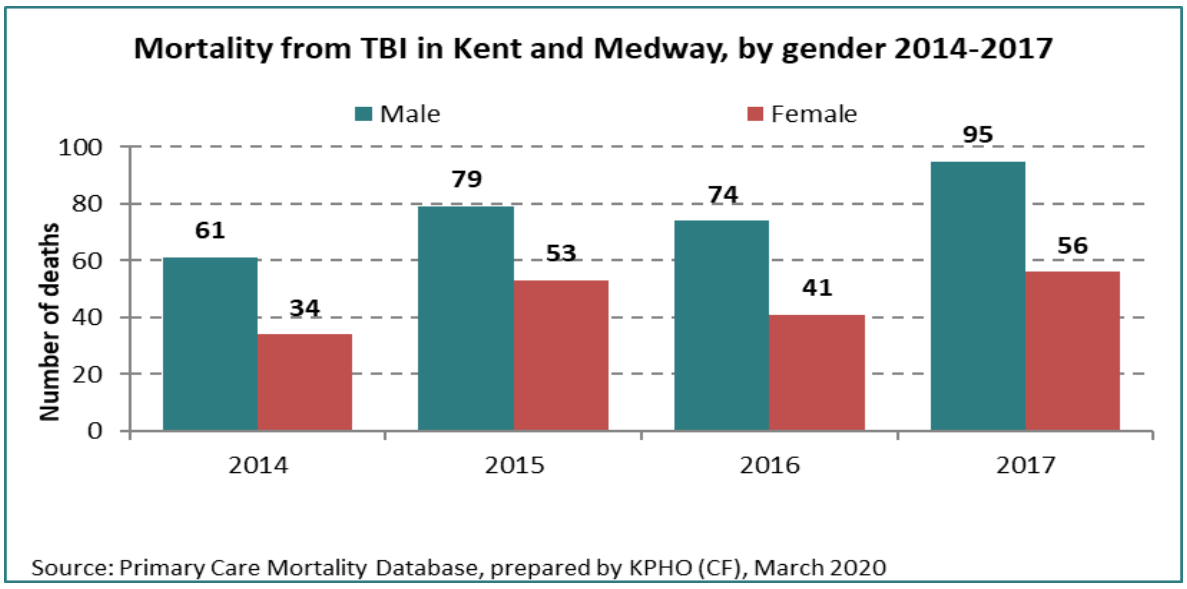
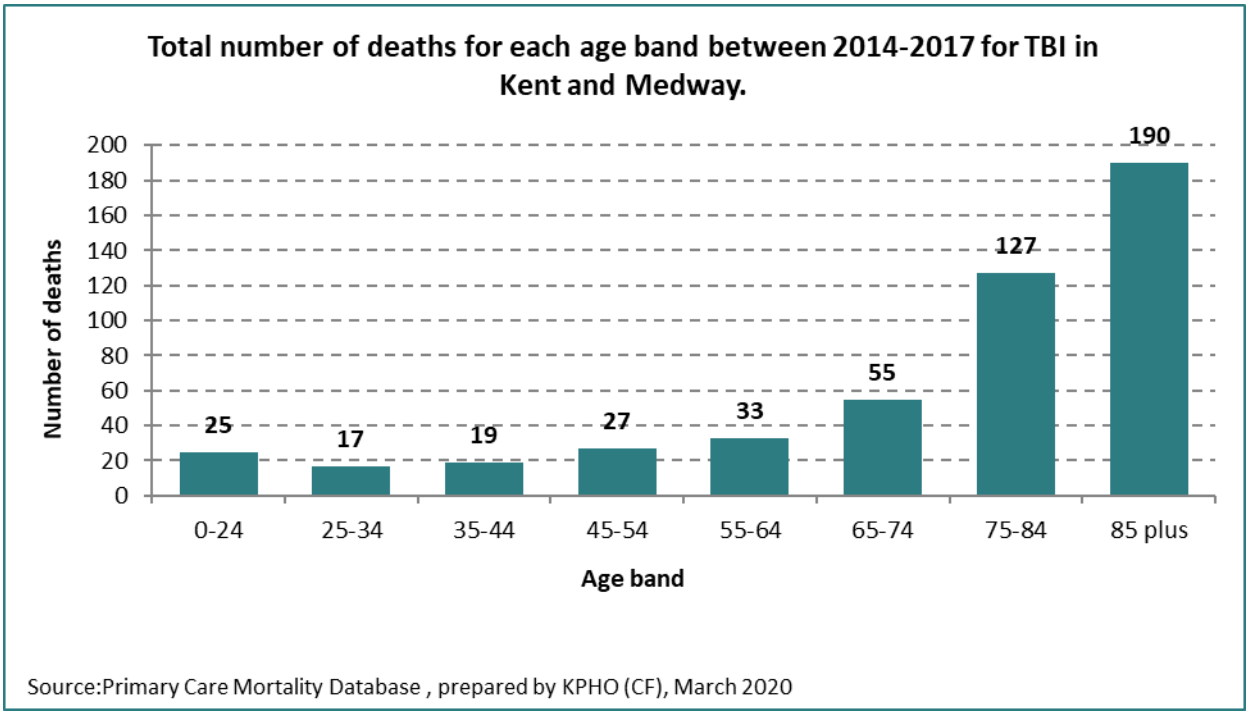


Figure 6:



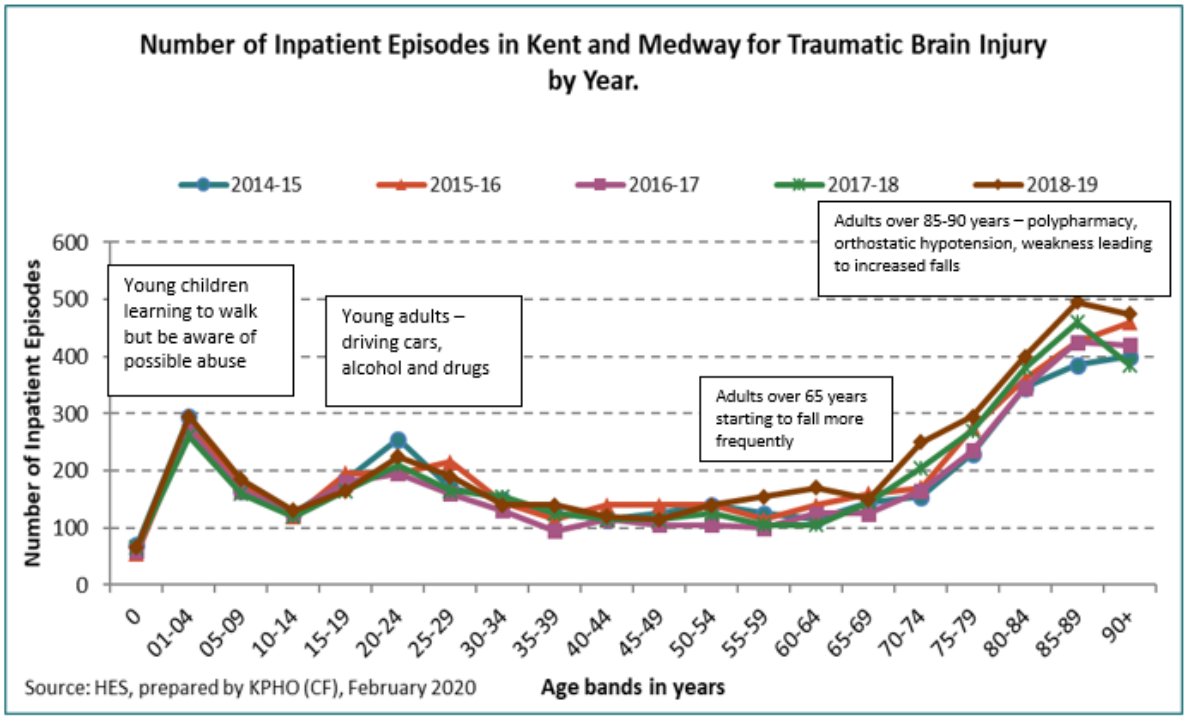
Source:Primary Care Mortality Database , prepared by KPHO (CF), March 2020

The number of deaths increases per increasing age. This is not surprising as we know that older aged people are at higher risk of having a TBI. Due to their general age and frailty they are also likely to be more susceptible to dying from their TBI. The other group that has a slightly higher number, out of keeping with the age trend, is the 0-24 years. This is also not surprising given that we know that this age group are also susceptible to TBI.

2.3.4 By age

The chart below clearly shows that there are points within the life-course where TBI is more likely to occur. It is remarkable how stable this picture is over five years with the same age peaks. It is at these points that public health preventative measures should be considered to make the most impact on admissions for TBI in Kent and Medway. In addition, any acute or rehabilitation services for TBI should consider this age pattern and provide age-appropriate services and support.

Figure 7:



The under 5's make up a significant proportion of head injuries. In 2018-19 children under 5 years account for 8% of all admission for traumatic head injury. This is also significant as it is estimated that 25–30% of children aged under 2 years who are hospitalised with head injury have an abusive head injury. [13]

Head injury is the commonest cause of death and disability in people aged 1–40 years in the UK.[14] In 2018-19 0-39-year olds made up 36% of all TBI admissions in Kent and Medway. In particular, people between 15 -29 years notably made up 14% of all TBI admissions in 2018-19, a 2% decrease when compared to 16% in 2014-15

However, the largest group is 65 years and over who make up 48% of all admissions in 2018-19. Moreover, those in the oldest age band (90 years +) make up 11% of all admissions. This has increased since 2014-15 when 65 years and over made up 44% of all admissions, with 90+ age group being 10% of all admissions. The pattern for the over 75's also reflects the growing problem with that group making up 36% in 2014-15 and 39% in 2018-19. The rising proportions of older people suffering TBI are likely to reflect the changing demographics with a growing elderly population.

[13] https://www.nice.org.uk/guidance/cg176/chapter/introduction

[14] https://www.nice.org.uk/guidance/cg176/chapter/introduction Head injury: assessment and early management Clinical guideline [CG176] Published date: January 2014 Last updated: September 2019

This is a pattern consistent with other research findings. Older people make up most traumatic brain injuries. Falls are the leading cause for older adults (51%) and motor vehicle crashes (pedestrian or driver/passenger) are second (9%). Assaults count for 1% in older adults.[15]

Table 4: Differing age groups proportions (by percentage) for admissions with TBI

	2014-15	2018-19
% under 15 years	17	16
% under 5 years	8	8
%15-29 years	16	14
%over 75 years	36	39
%over 90 years	10	11
%20-29 years	11	10
%15-24 years	12	9
%0-39%	40	36

2.3.5 By gender

Nationally, men are 1.5 times more likely than women to be admitted for head injury. However, it is reported that female head injury admissions have risen 23% since 2005-6[16].

The following chart shows that there are more men in Kent and Medway than women to have a traumatic head injury. There was a similar difference in the number of inpatient episodes for men and women between 2015-2018 with 2014-15 showing a larger gap and a widening gap in 2018-19.

[15] Thompson, H et al, J Am Geriatr Soc. 2006 October; 54(10): 1590–1595

[16] https://www.headway.org.uk/about-brain-injury/further-information/statistics/

Figure 8:

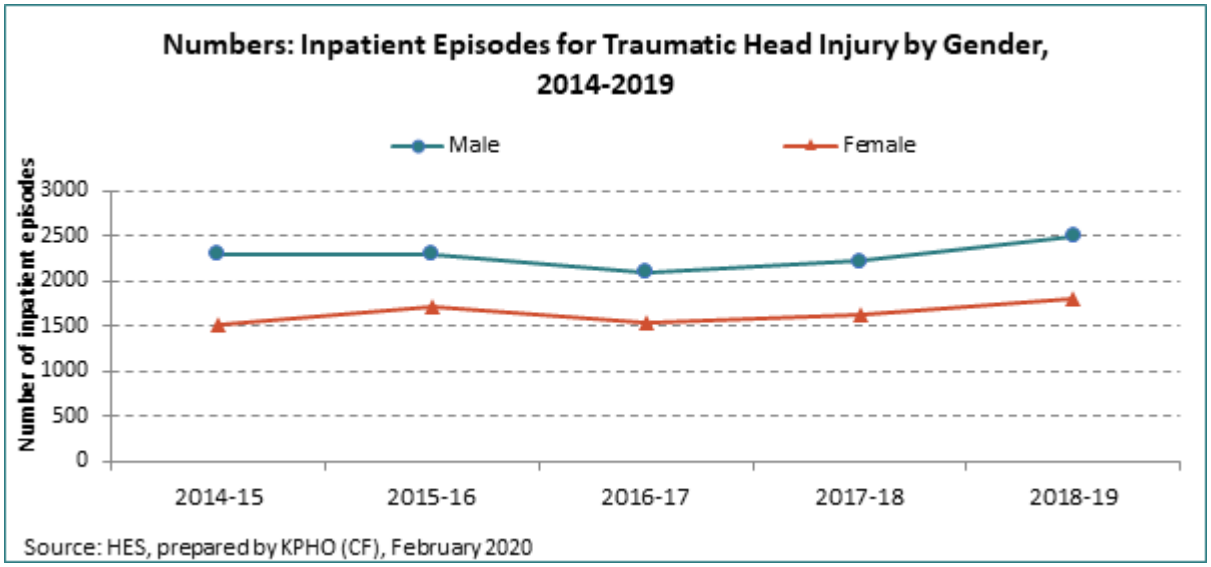
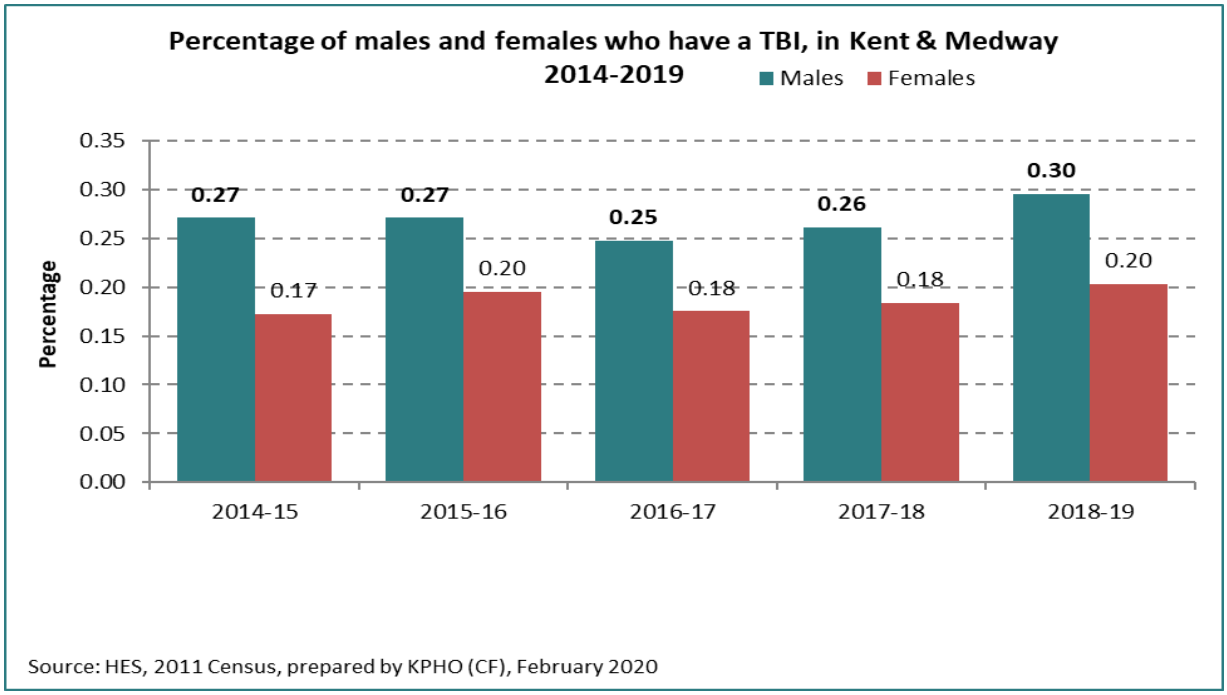


Figure 9:



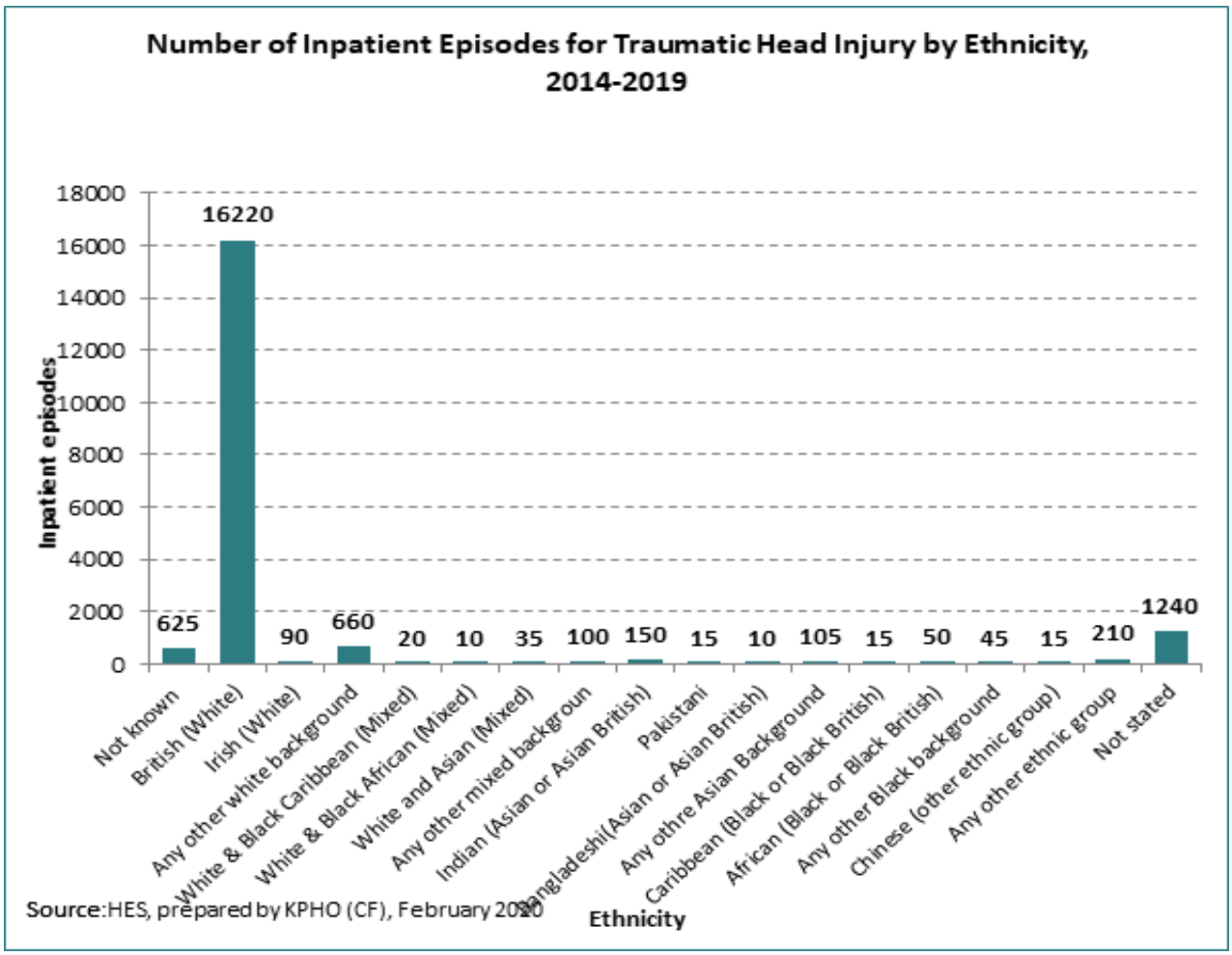
By calculating the percentage of males and females who have a TBI it can be shown that men are more likely to have a TBI in the order of between 30-45%. However, according to hospital episode data, in 2014-15 it was the case that men were 45% more likely to have a head injury than women, this was 33% more likely in 2016-17 and in 2018-19 men were 40% more likely than women. Therefore, the data in Kent and Medway does not reflect the national picture. This is possibly because the hospital episode data only captures the more severe end of TBI when people are admitted to hospital.

However, from a public health perspective, men are consistently more likely than women to have a head injury. This is important as it means that initiatives to try and reduce head injuries could be more targeted towards men.

2.3.6 Ethnicity

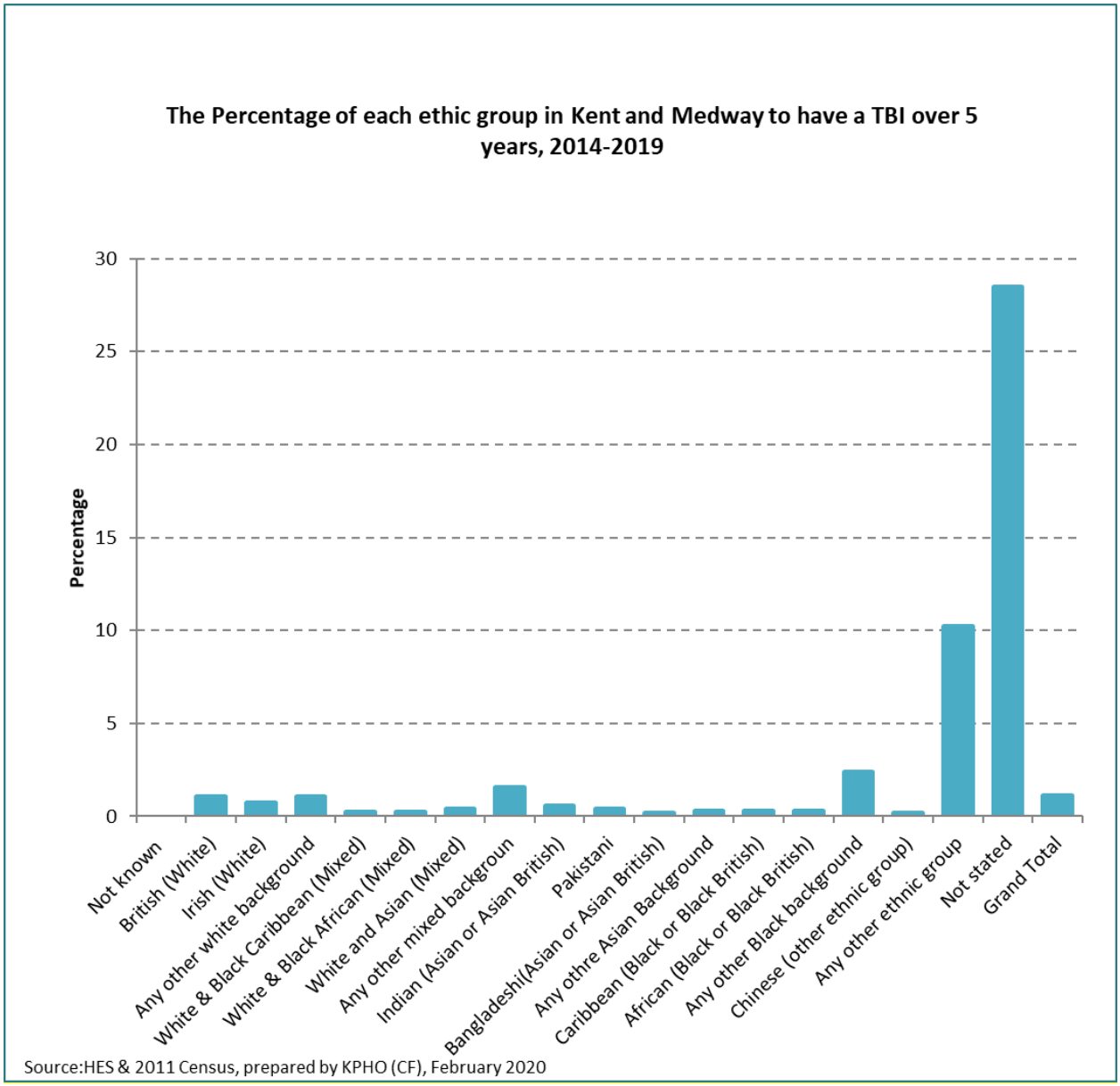
The vast number of inpatient episodes in Kent and Medway are patients who identify as British (white) with 16220 episodes between 2014-19. The next largest groups (excepting no known/not stated groups is 'any other white background' with 660 episodes. This is not surprising given the demographic of Kent and Medway.

Figure 10:



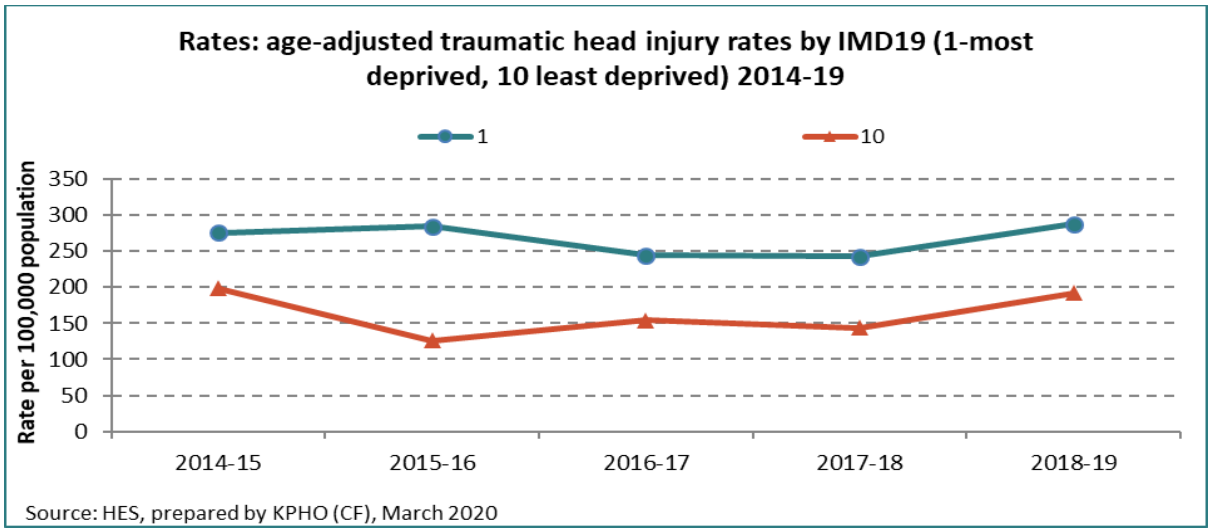
To investigate further whether ethnic minorities are at higher risk for a TBI in Kent and Medway the latest census demographics were used in order to give relative percentages. Again, excluding the large not stated/any other ethnic group, the popuations with the highest relative percentages of TBI were 'any other black backgroud' followed by 'any other mixed background'. This shows that in fact, ethnic minorities are at a higher risk for TBI in Kent and Medway.

Figure 11:



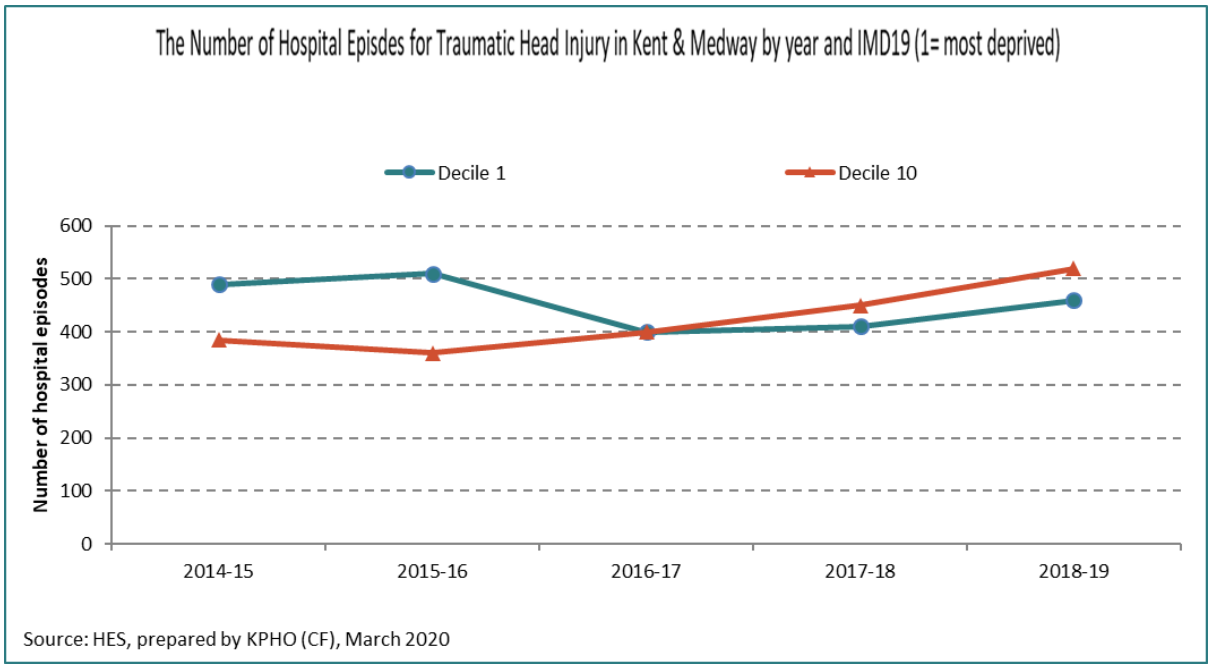
2.3.7 The effect of deprivation on traumatic head injury

Figure 12:



Those in the most deprived decile by IMD19 (decile 1) , have a consistently higher rate of TBI than those in the least deprived decile by IMD19 (decile 10).

Figure 13:



However, from a service perspective, interestingly there are now higher numbers of least deprived (Decile 10) patients attending hospital.

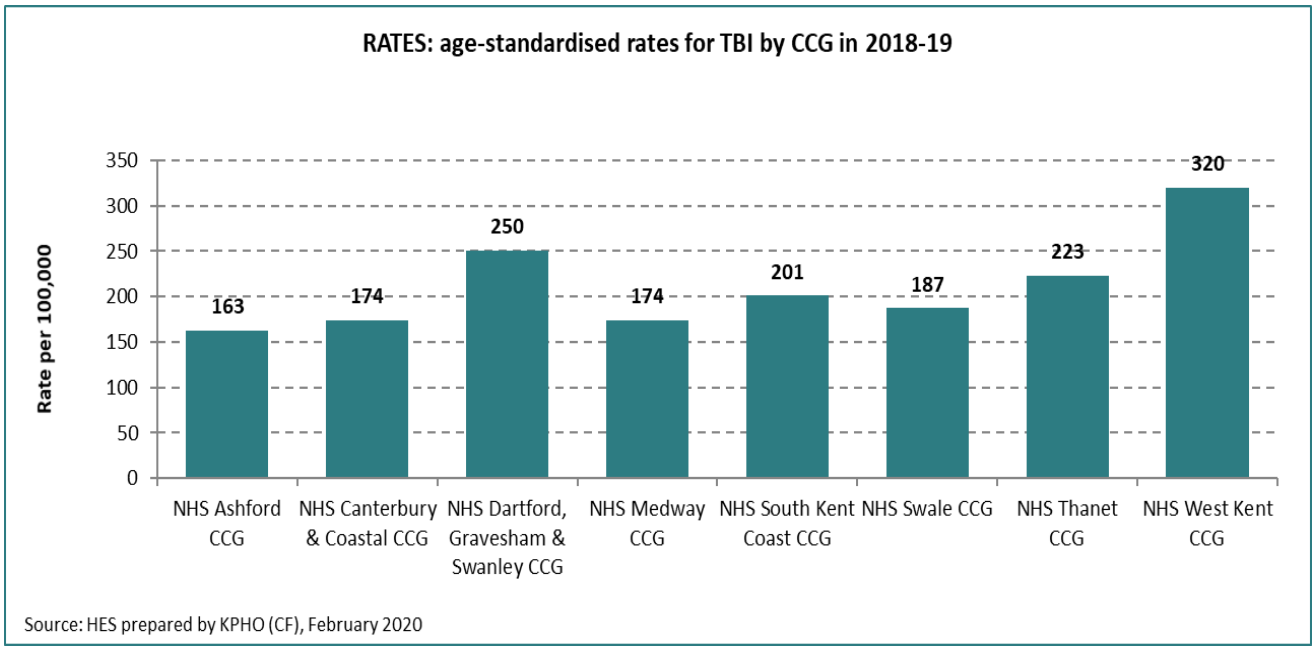
From a public health perspective, however, it is imperative to try and reduce the incidence of TBI in the most deprived section of our communities. They could be more at risk due to an association with deprivation with drugs and alcohol, or risk -taking and accidents.

2.3.8 The effect of location (designated by CCGs pre-April 2020)[17] on traumatic brain injury.

In the most recent data set, 2018-19 it is notable that even in age-standardised rates, the area represented by residents of West Kent CCG has the highest rate of traumatic brain injury admissions, with 320 admissions per 100,000 admissions. The areas represented by the lowest rates are Ashford CCG area, with 163 admissions per 100,000 population. Both Canterbury and Coastal and Medway CCG areas have the second lowest rates with 174 admissions per 100,000 admissions.

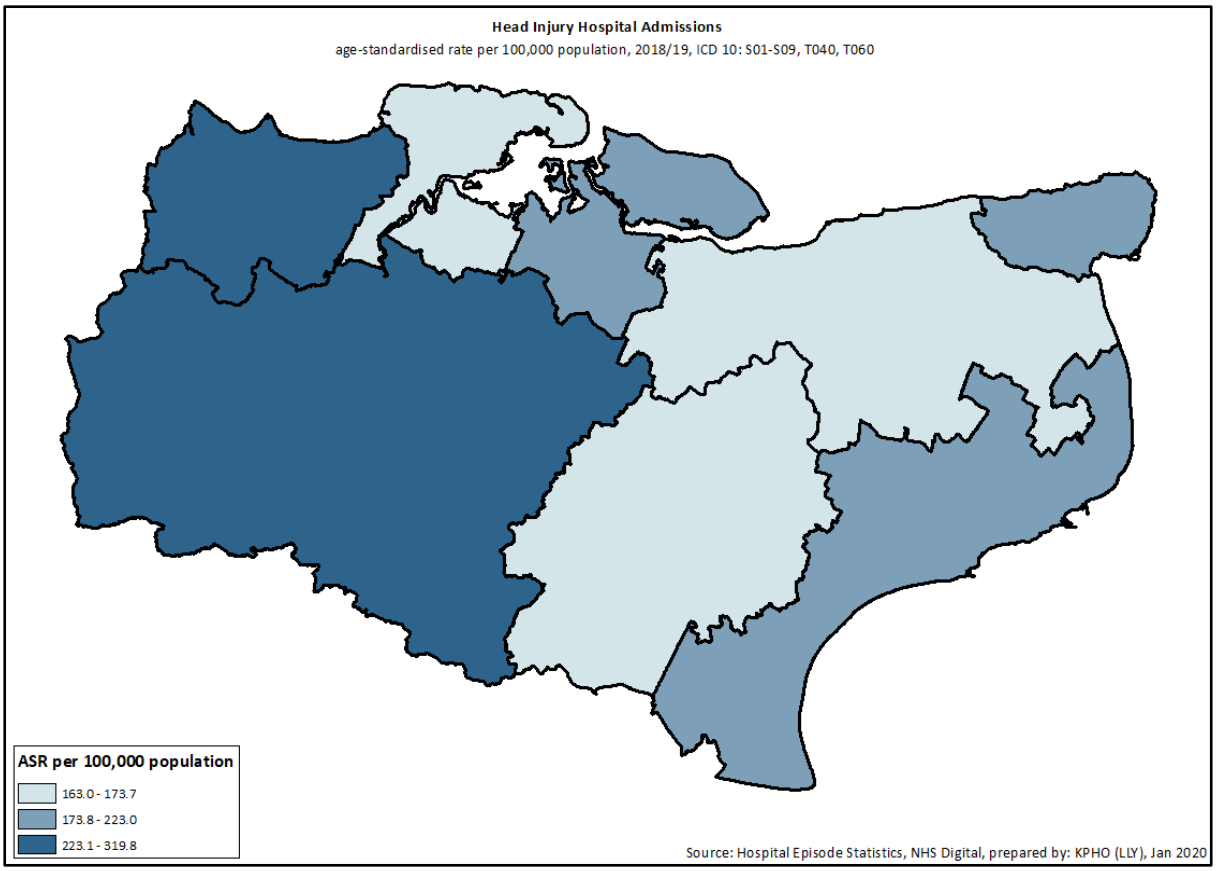
It would be interesting to establish how many patients entering the East Kent Neuro-Rehabilitation Unit attend from West Kent compared to East Kent and Medway.

Figure 14:



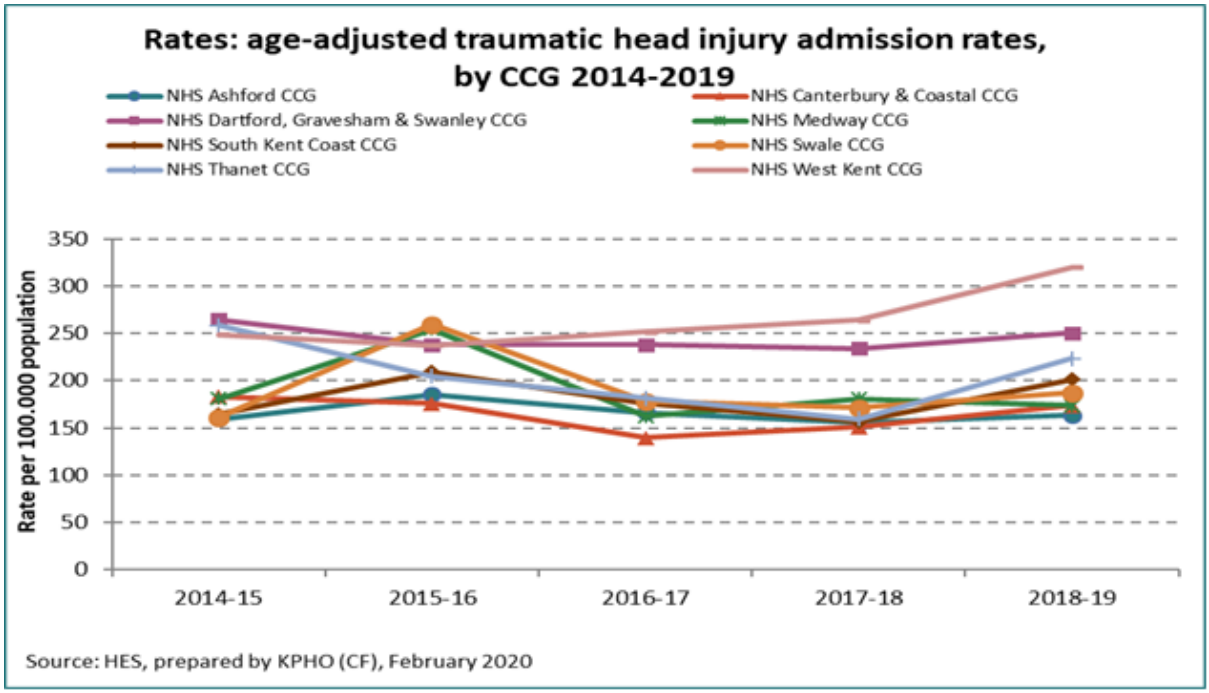
[17] This report was commissioned and written when there were eight Clinical Commissioning Groups (CCGs) in Kent and Medway. However, on 1st April 2021 the eight CCGs will combine into one Kent and Medway CCG.

Figure 15: Head Injury Hospital Admissions



The map clearly shows the highest rates within the Kent and Medway area to be in the West Kent area. In the following chart you can see the trends for all the CCG areas by year from 2014-15 to 2018-19. From this you can see that in 2014-15 Dartford, Gravesham and Swanley (DGS) CCG had the highest admission rates. In 2015-16 Swale and Medway CCG areas became the highest with both West Kent and DGS, at a similar level in second position. Canterbury and Coastal had the lowest rate. However, between 2016-17 and 2018-19 West Kent has steadily increased in rate whilst DGS has slightly reduced overall. Medway has significantly reduced its admission rates to be the middle area in 2018-19. Ashford CCG has the lowest rate in 2018-19.

Figure 16:

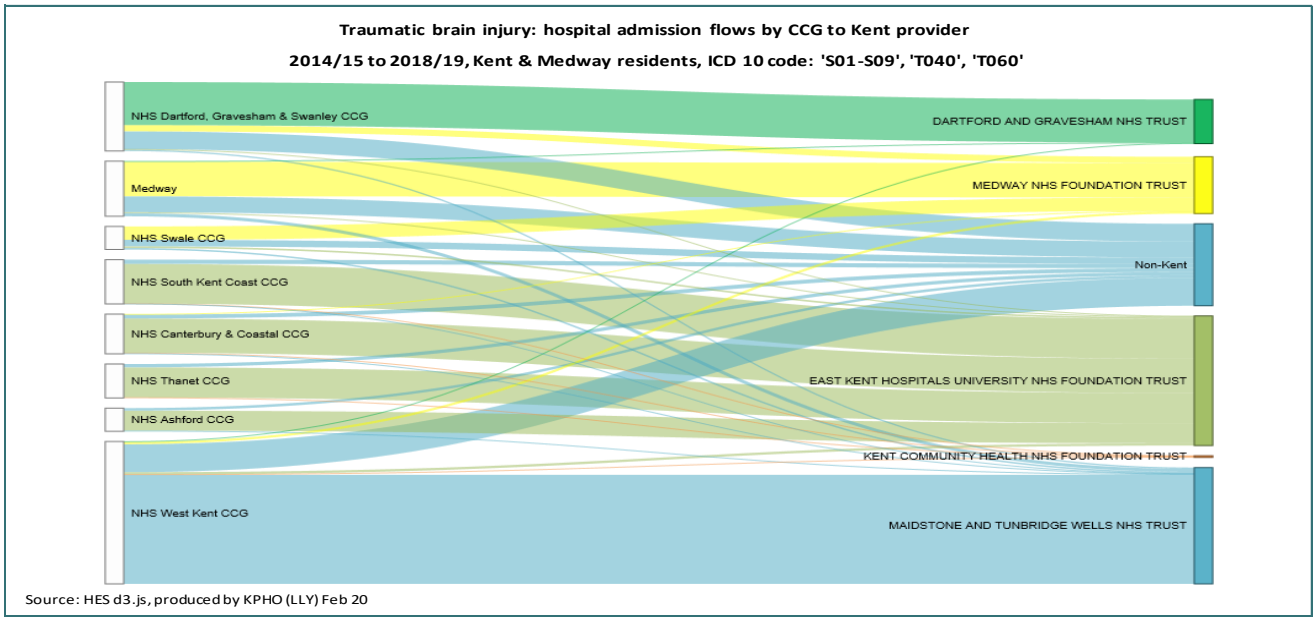


From the map, there is a west/east divide in the rate of admissions for TBI. It is interesting to consider why this might be, although further research would be required to establish why this is. It could be for a reason such as people in West Kent are more likely to present to hospital with a less serious injury, or could it be because the West has a large nighttime economy.

2.4 Where do people go for treatment of their TBI

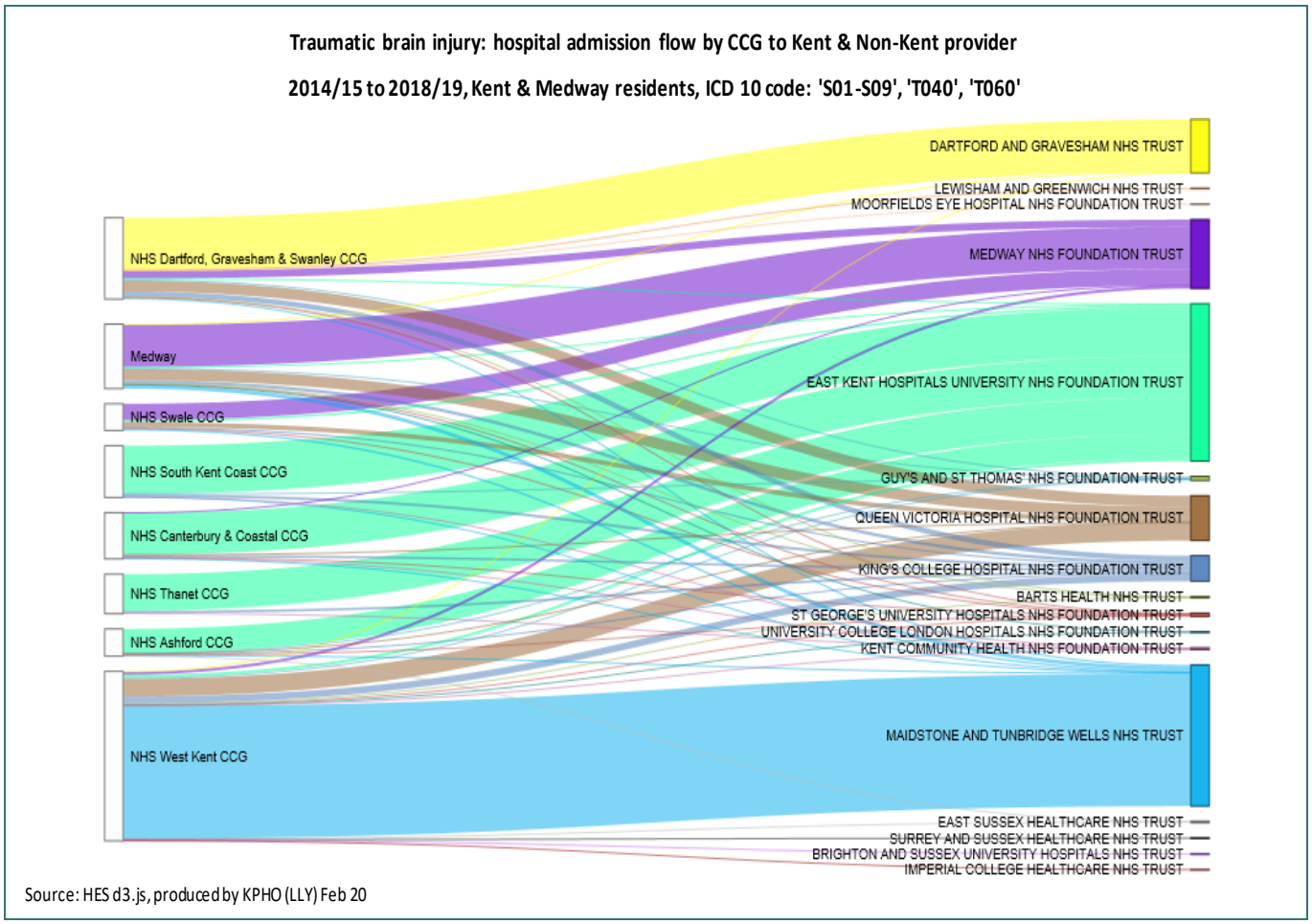
2.4.1 Providers within Kent and providers external to Kent Sankey diagrams

Figure 17: Traumatic brain injury hospital admission flows by CCG to Kent provider



The Sankey Diagram is a pictorial representation of the patient flows for TBI in Kent and Medway. From this, it is seen that most patients attend their nearest hospital.

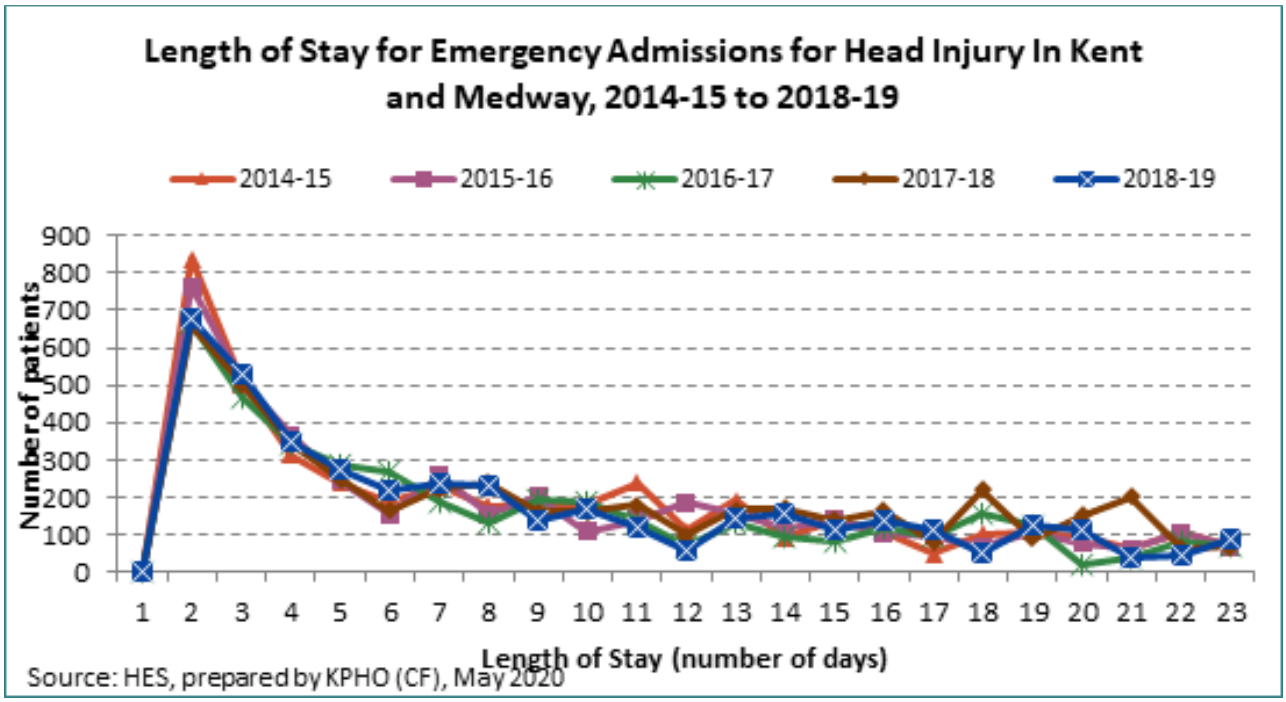
Figure 18: Traumatic brain injury hospital admission flow by CCG to Kent and non-Kent provider



This chart is a Sankey Diagram representing patient flows to hospitals outside of their local area. From this chart some patients receive treatment at hospitals further afield. This is especially true of some of the London hospitals. However, overall, this chart shows that the numbers going outside of their areas are small, with most patients attending their local hospitals for their traumatic brain injury.

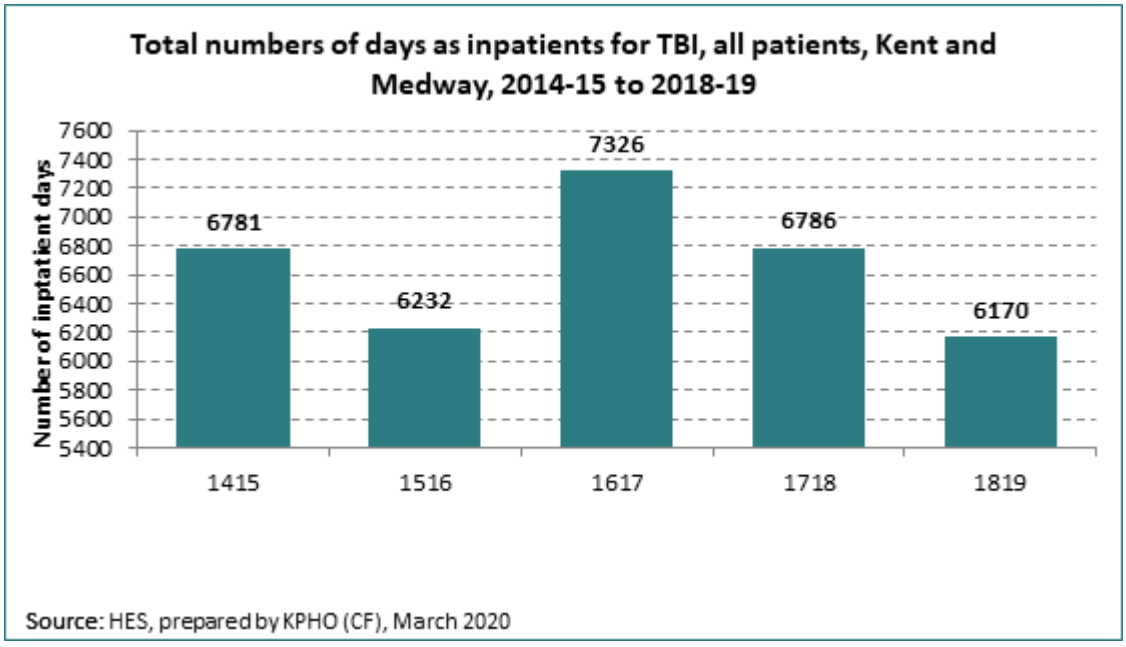
2.4.2 Length of stay in acute care

Figure 19:



The pattern of length of stay for TBI in Kent and Medway has been very consistent over the last five years. This suggests there has not been a significant change in approach to treating TBI patients. Most people who have a TBI will spend 2-3 days as an inpatient. However, there is a not insignificant number of people who have much longer admissions as seen on the chart.

Figure 20:

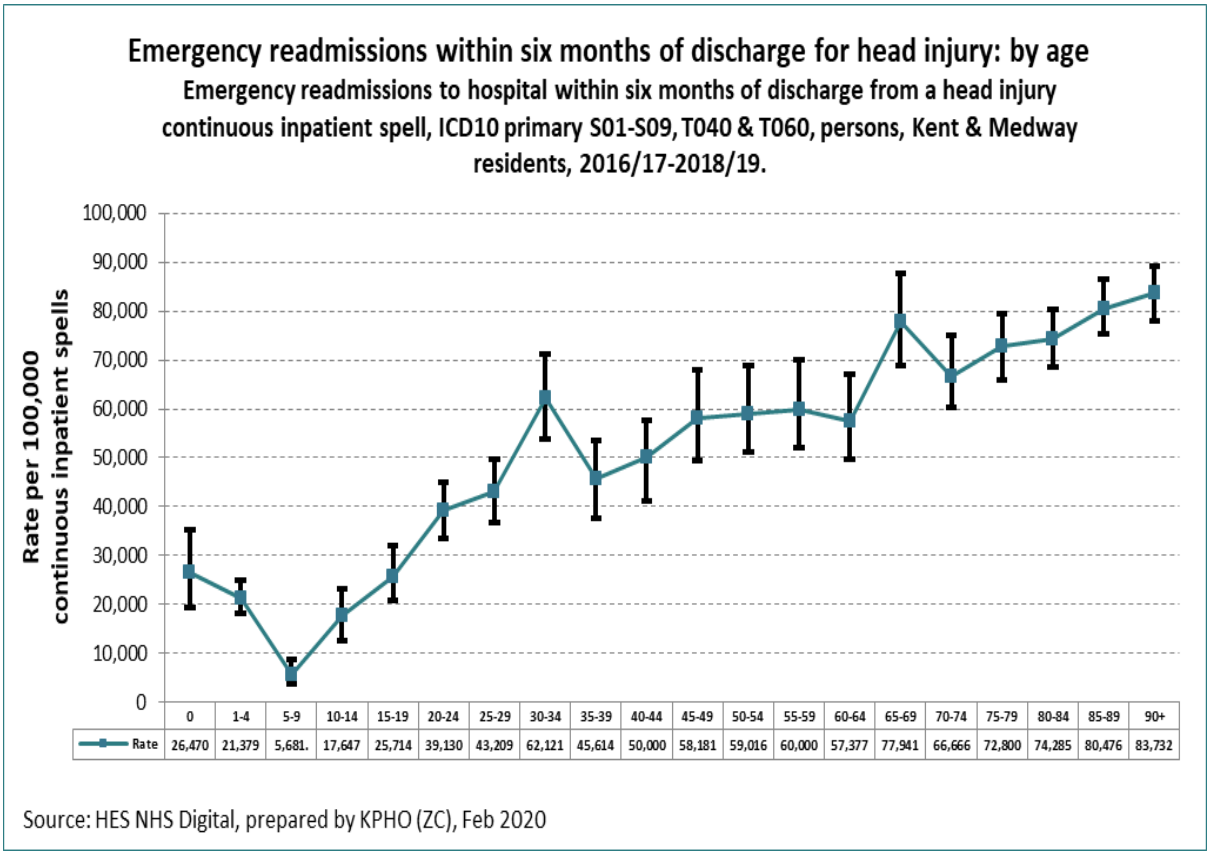


The total number of days spent in hospital for all TBI patients has varied over the previous five years. 2016-17 had the highest number of days spent in hospital with 7326 days. In 2015-16 there were 6232 inpatient days which is a decrease of 15% compared to 2016-17. It is difficult to assess why there is variation between the years but it may be due to several causes, such as a few patients with a significantly more severe head injury leading to longer inpatients admissions or more patients having less severe head injuries, therefore more patients having short admissions leading to the net result of more patient admission days overall.

2.4.3 Readmission volume

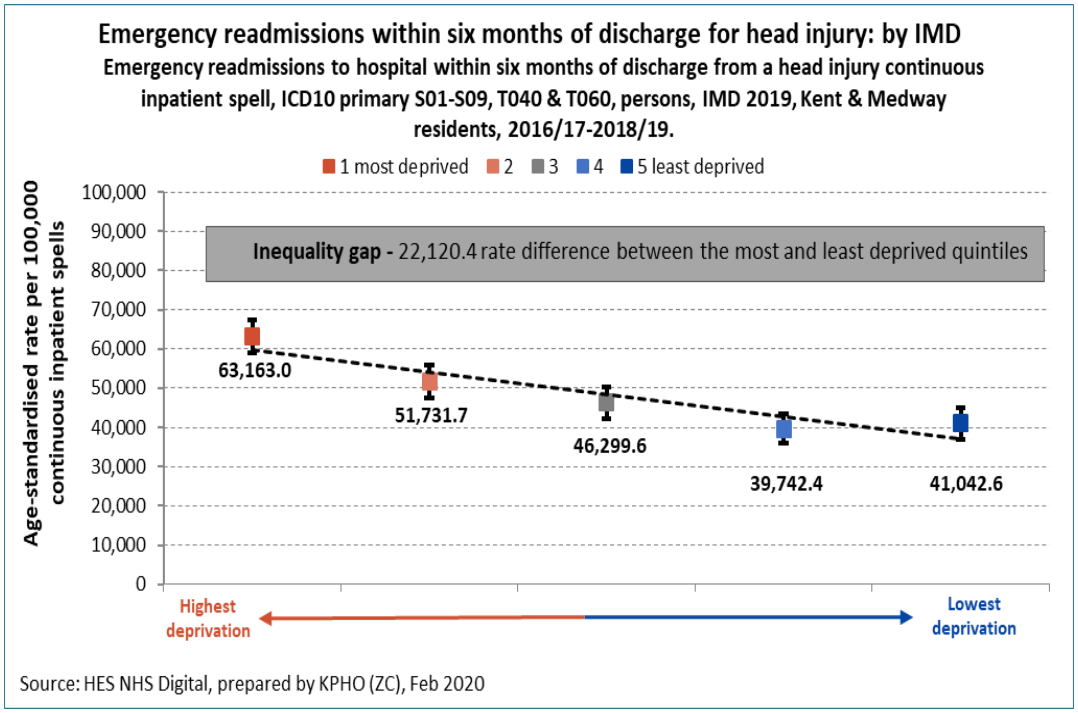
Between 2016/17 and 2018/19 there was an annual average of 3,105 Continuous Inpatient Spell (CIPS) admissions for head injury across Kent and Medway. Among those identified with a CIPS admission for head injury there were an average of 1,765 emergency readmissions across the same time period.

Figure 21:



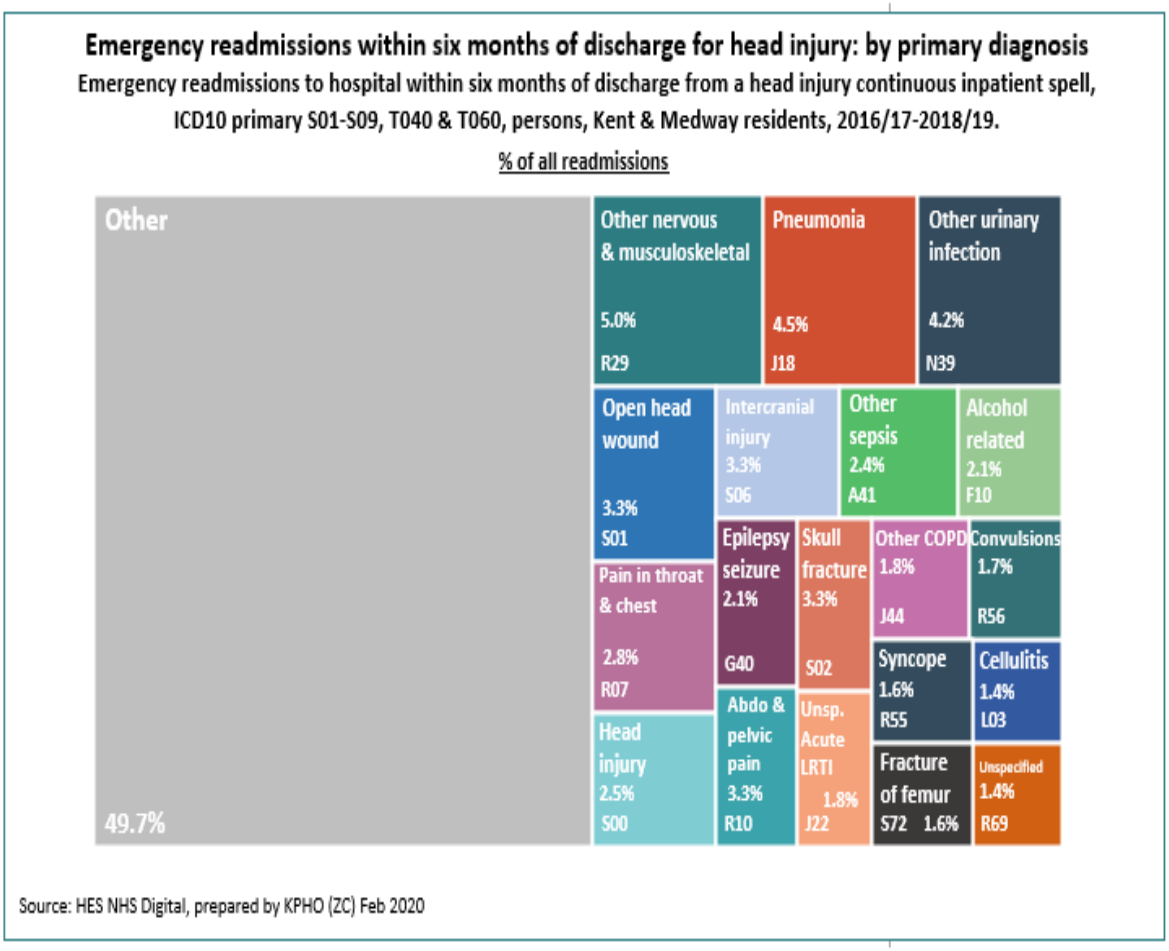
Emergency readmissions within six months of discharge for head injury increased with age. The crude rate of readmissions per 100,000 CIPS was higher in those aged 60 and over compared to the 0-29 and 30-59 age groups.

Figure 22:



Emergency readmissions within six months of discharge for head injury were associated with deprivation. The age-standardised rate of readmissions per 100,000 CIPS was higher in those resident in the most deprived areas compared to those resident in the least deprived areas across Kent and Medway. It is important to consider why this might be the case. There could be many factors involved such as their home environment, the support they receive on discharge and ability to pay, equity to rehabilitation services as well the likelihood that they may have other pre-existing conditions that may predispose them to a readmission; this is considered in the next chart.

Figure 23:



This chart explores emergency readmissions by primary diagnosis, analysis was restricted to the top 50% of causes.

- Around 10% of admissions would also be included within our head injury diagnosis criteria; head injury (S00), open head wound (S01), skull fracture (S02) and intercranial injury (S06). It is not clear whether this refers to the original or a subsequent additional head injury.
- Infection can be related to around 14% of admissions; pneumonia (J18), other urinary infection (N39), other sepsis (A41), unspecified acute lower respiratory tract infection (J22) and cellulitis (L03).
- Other key contributing causes included:
    - 5% of admissions related to other symptoms and signs involving the nervous system.
    - 5% of admissions were related to syncope (R55), as well as, convulsions or seizure, either epilepsy related (G40) or unspecified (R56).
    - 5% of admissions related to pain, in throat or chest and abdominal or pelvic.
    - 1.8% of admissions related to other COPD.

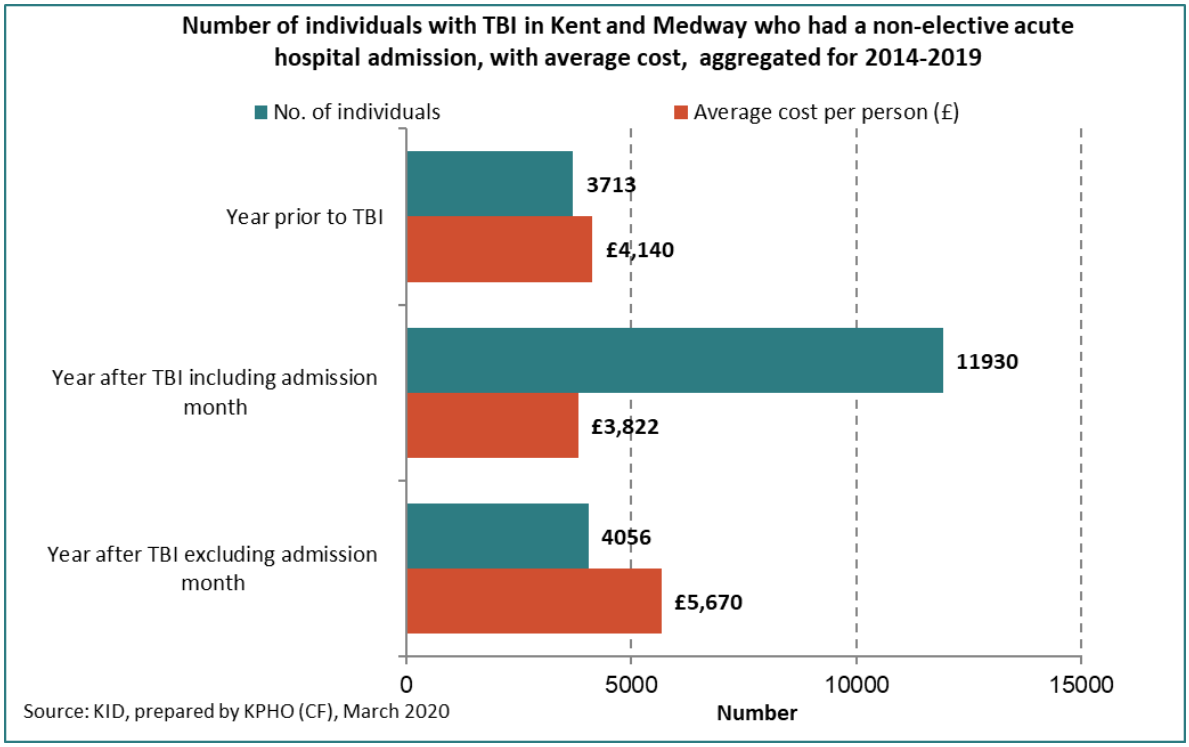
- 1.6% of admissions related to fracture of femur

3 The Ongoing Issues for People with Traumatic Brain Injury

3.1 The Financial cost of Traumatic Brain Injury

3.1.1 Costs of non-elective acute hospital admission

Figure 24:



The highest number of non-elective admissions to hospital for a TBI (aggregated for 2014-2019) was in the year after TBI including the admission month: 11,930 individuals. This is expected as this is a measure of the people who have a TBI who stay in hospital acutely. It is interesting that the average cost per person in this group is the lowest at £3,822. However, this can be explained as the range of severity of TBI will be from mild to severe. The milder cases will, on average, likely cost less that the severe cases due to the time spent in hospital, and complexity of care.

In the year prior to the TBI, it is interesting that a significant proportion of the patients also had an admission to hospital: 3,713 individuals. These had an average cost of £4,140 per person, which was a greater average cost than those who had an acute TBI (£3,882).

Indeed, 31% of individuals who went on to have a TBI had had an acute admission in the preceding year. This is not wholly surprising, as we have established that one of the risk groups is older people, who may be more likely to suffer multiple conditions, as well as polypharmacy, and have a higher underlying rate of acute admissions.

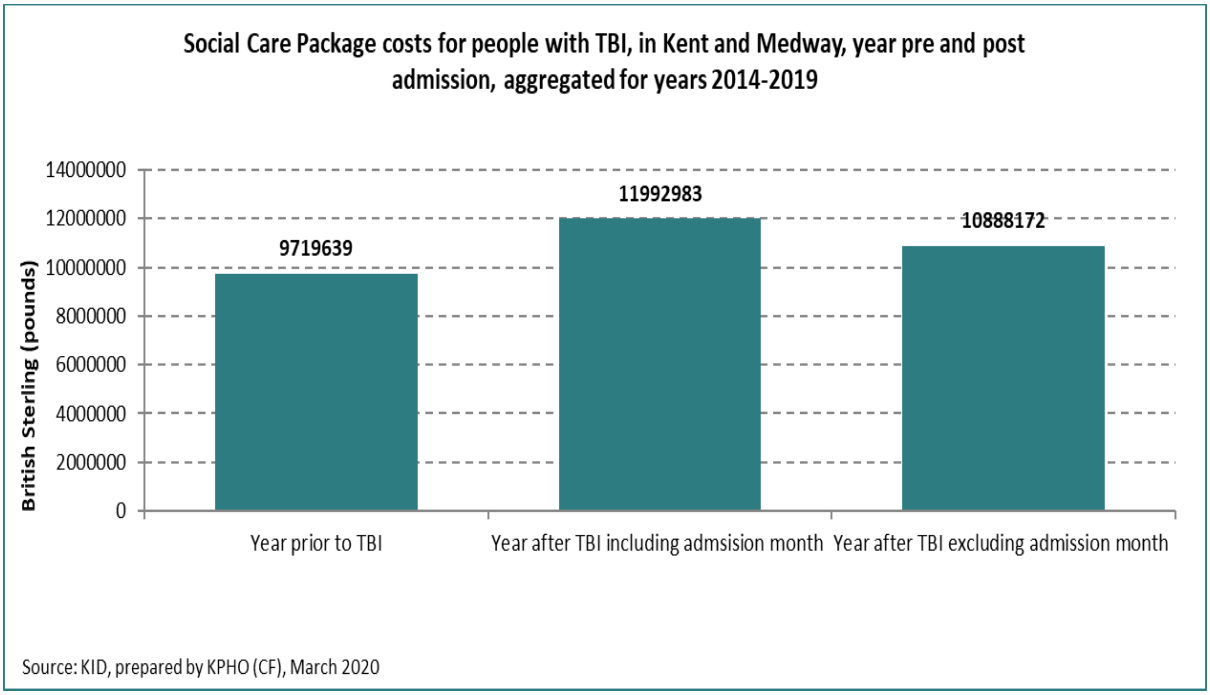
In the year following the TBI, excluding admission month, the number of individuals needing non-elective admissions was 9.2% higher than pre-TBI, suggesting that traumatic brain injury has a negative effect on subsequent non-elective admissions. This suggests that TBI has a significant effect on increasing the number of people needing an emergency hospital admission.

The individuals requiring non-elective admissions in the year following the TBI, excluding admission month (4,056), compared to the acute TBI (11,930), is 66% lower. This is a reflection that many of the acute TBI admissions were likely to be milder cases who did not, on average, cost so much, nor did they stay as long – and they didn't have a subsequent non-elective admission in the following year.

The reasons for increased non-elective admission activity could be related to TBI or another underlying, unrelated condition. We have explored some of the reasons for readmission after TBI in 2.4.3. For these individuals, the average cost of £5,670 was higher than the other two groups, again, probably reflecting the complexity of medical conditions and required treatment.

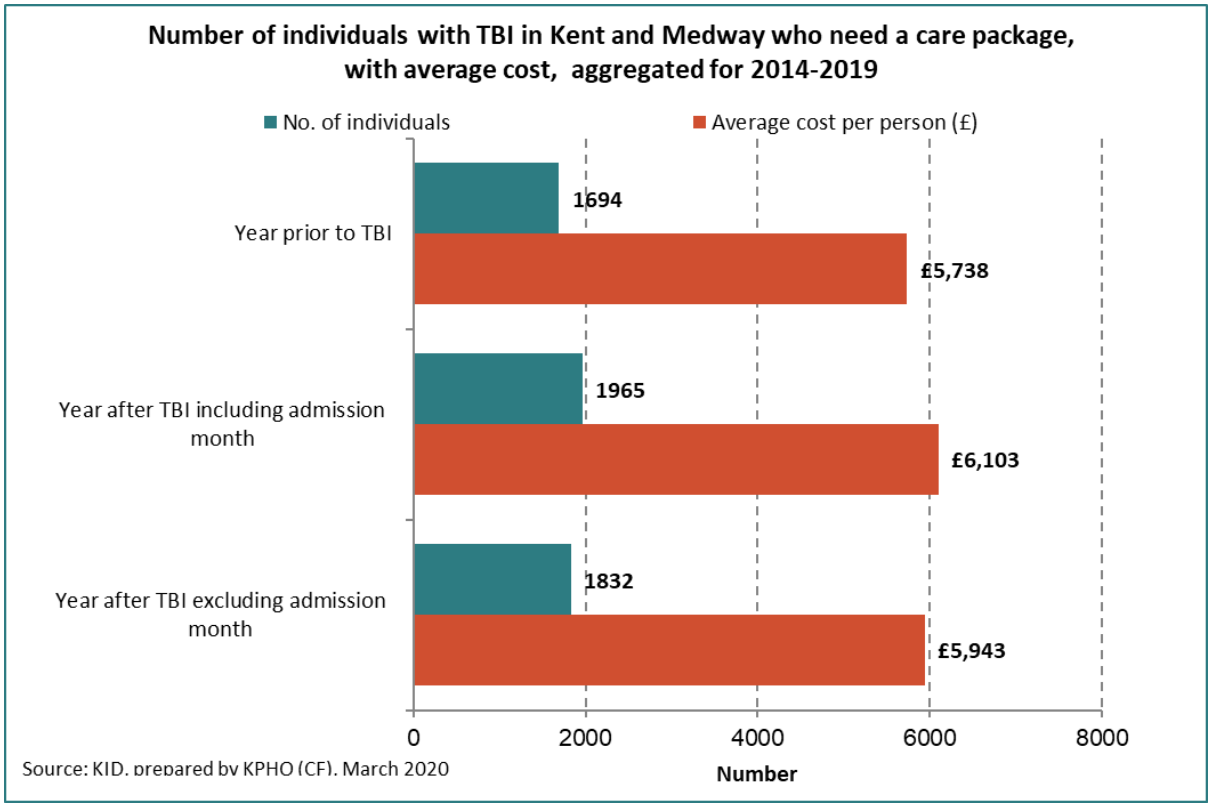
3.1.2 The Impact of Traumatic Brain Injury on Social Care.

Figure 25:



In Kent and Medway, between 2014 and 2019, the year after TBI, including admission month, shows the highest social care package cost (£11,992,982). This is a 23% increase in costs compared to the year prior to their TBI and shows that there is a significant increase in social care costs for TBI in the year of the accident, especially acutely. The admission month is particularly costly, with £1,104,811, or 10%, more than the year after with the admission month excluded. In the year after TBI, excluding admission month, the overall social care costs are still higher than in the year prior, with an increase of 12%. This probably reflects that the TBI has significant longer-term effects on individuals' ability to manage independently.

Figure 26:



There were 1,694 individuals who needed a care package prior to their TBI admission in Kent and Medway, in 2014-2019. This would suggest that already-vulnerable people have TBI. In the year after TBI, including admission month, this increased to 1,965 people needing a care package, with a slighter higher cost of £6,103, on average. This is not surprising, as people who have had a TBI might be expected to need additional personal support. However, the increase in individuals needing a care package is not as high as in 3.1.1., where the number of individuals admitted in the year following TBI, including admission month, was 11,930. This means that only a relatively small proportion of individuals admitted for TBI need a care package. This also reflects the suggestion that many of the 11,930 individuals will have a milder TBI and not require a long admission, nor additional support at home.

In the year following the TBI, excluding admission month, there is still a small, increased number of individuals needing social care packages: 1,832 individuals, compared to 1,694, the number prior to the TBI; an increase of 8%. This shows that TBI can be a significant event that, for a minority, has long-lasting effects, sufficient enough to require assistance with activities of daily living.

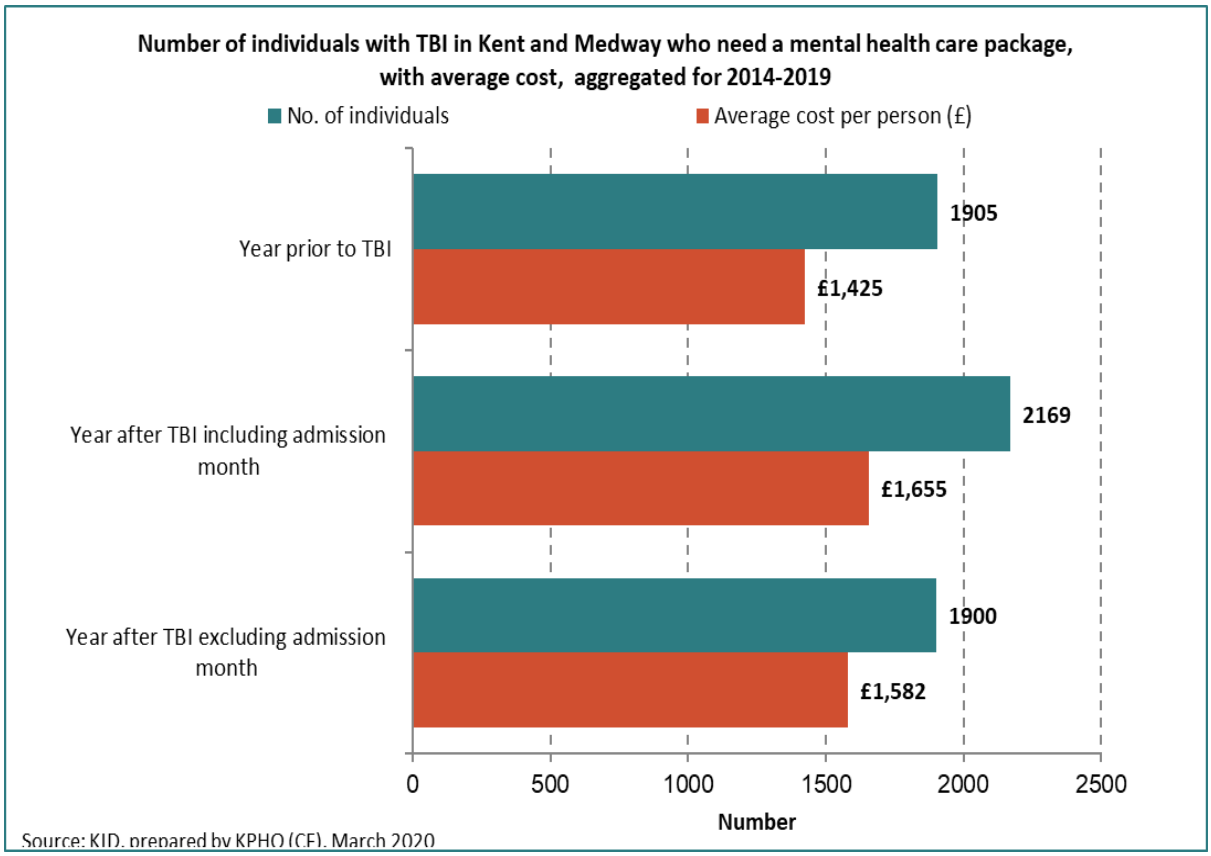
3.1.3 Mental Health in Traumatic Brain Injury (TBI)

There are reported to be long term mental health consequences following a TBI. The following chart shows that, when including the month of admission for TBI, the numbers of patients accessing mental health care packages, 2,169, increased from the year prior to TBI,

1,905, by 14%. Whilst supporting the matter that acute TBI causes mental health issues, it also suggests that there is a significant number of individuals needing a mental health care package prior to their TBI. It is interesting that the average cost per individual increased from £1,425, in the year prior to the TBI, to £1,655, in the year after the TBI, including admission month. This is an increase in cost per individual of 16%, suggesting that mental health issues relating to, or following, a TBI have an added complexity and, therefore, cost.

In the year following the TBI, the lowest number of individuals accessed the mental health care package: 1,900 individuals. This is surprising, but it is possible that those who were affected more in the pre-TBI or acute-TBI stages were moved into different rehabilitation settings, or other community settings, where they do not access a separate mental health care package. It is also possible that some of the individuals who previously needed a care package died of their acute TBI or other conditions. In terms of the cost, the year after TBI, excluding admission month, sits in the middle, between pre-TBI and the year after TBI, including admission month. This suggests that the people needing a longer-term mental care package are more impacted than prior to their TBI, but their needs are not as great as during their acute TBI.

Figure 27:



3.1.4 Traumatic Brain Injury and Violence

It is beyond the scope of this project to analyse the links between traumatic brain injury and violence. That said, this is an important link and is deserving of further analysis in a future project.

4 | Appendix A

4.1 Methods

We took data from both the Hospital Episode Statistics (HES), the Primary Care Mortality Database and the Kent Integrated Database (KID).
For identifying cases with a traumatic brain injury/head injury we used the following ICD10 codes in a primary or secondary diagnoses position for years 2014-2019.

- SO1-9
- TO40
- TO60

Please note that the data may be skewed around a more seriously injured population, due to the use of HES and KID (where a medical contact must have been made), and there will be a milder population who never seek any professional medical input.

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