NDTMS Themed Report

Patterns of mortality amongst individuals in contact with structured drug and alcohol treatment services in the North West of England

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December 2010

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Centre for Public Health

Acknowledgements

The authors would like to thank the following people for their help in the collection of data and in the production of the report: the staff at all treatment providers, Pauline Wall at the Office for National Statistics, along with the following colleagues at the Centre for Public Health; Jessica Salmon, Karen Hoare, Charles Gibbons, Clare Heraty, Mark Whitfield, Howard Reed, Lee Tisdall and David Seddon. The authors would also like to thank the Drug (and Alcohol) Action Teams and Primary Care Trusts in the North West of England, along with staff from regional and national NTA.

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Drug Related Deaths (DRD)

The mortality rate among opioid users is known to be considerably elevated, fatal heroin overdose is a significant cause of mortality for injecting drug users (IDUs) with approximately 2-3% of heroin users dying each year, a rate that is between 6 and 20 times higher than those expected among non-drug using peers of the same age and gender (Clausen et al., 2008; Darke et al., 1996; Darke et al., 2007; Davoli et al., 2007). In 2000, the Advisory Council on the Misuse of Drugs (ACMD) raised concern about the increasing number of deaths related to drug use within the UK (ACMD, 2000), despite increases in average life expectancy for both males and females (Office of National Statistics, 2008). In response, the Department of Health Action Plan 2001 was initiated in an attempt to reduce the number of DRD (as classified by the National Drug Strategy definition of DRD) by 20% by 2004. The Drug Strategy definition of a DRD is ***'deaths where the underlying cause is poisoning, drug abuse or drug dependence and where any of the substances controlled under the Misuse of Drugs Act (1971) are involved'***. Within this definition, the majority of DRD are related to acute drug toxicity and typically occur in young men under thirty years of age (NTA, 2004). Other deaths which are included in this Drug Strategy definition are deaths which occurred while the person was under the acute influence of drugs.

The following causes of death are included as a headline indicator of a DRD (the relevant codes from the World Health Organization International Classification of Disease Register version 10 [ICD 10] are given in brackets):

a) Deaths where the underlying cause has been coded to the following categories of mental and behavioural disorders due to psychoactive substance use (excluding alcohol, tobacco and volatile solvents):

(i) Opioids (F11)

(ii) Cannabinoids (F12)

(iii) Sedatives or hypnotics (F13)

(iv) Cocaine (F14)

(v) Other stimulants, including caffeine (F15)

(vi) Hallucinogens (F16)

(vii) Multiple drug use and use of other psychoactive substances (F19)

b) Deaths coded to the following categories and where a drug controlled under the Misuse of Drugs Act 1971 was mentioned in the death record:

(i) Accidental poisoning by drugs, medicaments and biological substances (X40-X44)

(ii) Intentional self-poisoning by drugs, medicaments and biological substances (X60-X64)

(iii) Poisoning by drugs, medicaments and biological substances, undetermined intent (Y10-Y14)

(iv) Assault by drugs, medicaments and biological substances (X85)

(v) Mental and behavioural disorders due to the use of volatile solvents (F18)

The National Drug Strategy definition of a DRD refers to those cases where the underlying cause of death is directly attributable to drug use. Therefore, it does not include deaths where the underlying cause of mortality was a medical condition caused by long term drug use (e.g. cardiomyopathy due to prolonged drug use). Consequently, it is difficult to ascertain the full involvement of drug use in premature death because its contribution is not reported in official figures and therefore goes unrecognised (Beynon & McVeigh, 2007).

Drug associated deaths

Whilst there are targets to reduce DRD according to the Drugs Strategy definition, concern has also been raised about the vulnerability of drug users to various infectious diseases which can result in considerable levels of morbidity and mortality (ACMD, 2000; Health Protection Agency et al., 2009a; Beynon & McVeigh, 2007). These infectious diseases include viral infections (such as hepatitis C and HIV) and bacterial infections (such as tetanus and *Staphylcoccus aureus*). The use of crack cocaine, when smoked, has been linked with additional conditions such as bronchitis and pulmonary oedema, with the increase in blood pressure and heart rate from the use of cocaine being associated with cardiac failure and myocardial infarction (Kelleher, 2006).

Alcohol related death

The consumption of alcohol has both health and social consequences, and there is a direct dose-response relationship between alcohol consumption and risk of death (White et al., 2002). It is also well established that alcohol consumption contributes to traumatic outcomes through violence and injury. The number of alcohol-related deaths in the United Kingdom has consistently increased since the early 1990s, rising from the lowest figure of 4,023 (6.7 per 100,000) in 1992 to the highest of 9,031 (13.6 per 100,000) in 2008 (ONS, 2010). The Office of National Statistics (ONS) definition of alcohol-related deaths only includes those causes regarded as being most directly due to alcohol consumption. It does not include other diseases where alcohol has been shown to have some causal relationship, such as cancers of the mouth, oesophagus and liver. The definition includes all deaths from chronic liver disease and cirrhosis (excluding biliary cirrhosis) even where alcohol is not specifically mentioned on the death certificate. Apart from deaths due to poisoning with alcohol, this definition excludes any other external causes of death, such as road traffic accidents (see appendix I). Whilst the number of alcohol-related deaths, according to the ONS, has increased, there are also a number of causes of death which may be due, in part, to alcohol consumption that are not included within this definition. In 2008, the North West Public Health Observatory (NWPHO) estimated the number of deaths that can be attributed in some way to alcohol using an attributable fractions methodology. Applying this methodology they estimated there were 14,982 deaths attributable to alcohol consumption in 2005 (see appendix II), a 79% higher mortality rate than equivalent ONS figures (8,386).

The National Drug Treatment Monitoring System (NDTMS)

The NDTMS was introduced in April 2001 to collect data on all clients in contact with structured drug treatment services (i.e. high threshold tier 3 and 4 services as defined by the Models of Care, see National Treatment Agency [NTA], 2002 and 2006). It is mandatory for all drug treatment agencies to report pseudoanonymised information on all individuals in contact with their service. Routine monitoring was expanded in 2008/09 to collect data on clients receiving specialist alcohol treatment interventions. This data collection has resulted in the inclusion of data on those who died whilst in contact with structured alcohol treatment.

Methodology

NDTMS data for all clients in contact with structured treatment services in the North West of England between 1st April 2003 and 31st March 2009 were interrogated to identify individuals reported by the treatment providers as having died. The information was used to investigate the causes of death and also to identify any potential differences in the characteristics of those dying from a DRD and those dying from residual causes, along with any trend data across the six years of the study. The NDTMS collects information on the injecting behaviour of those in contact with treatment at the point of triage (first client face to face contact with treatment), specifically whether an individual was currently injecting, had previously or never injected. This information was used to determine whether those with a history of injecting drug use had contrasting underlying causes of death in comparison to those with no history of injecting drug use. In addition, alcohol NDTMS data for 2008/09 was also interrogated to identify those in alcohol treatment who were reported as having died.

Individuals were identified from their NDTMS attributor (incorporating initials, date of birth and gender) and information in relation to their partial postcode of residence, discharge date, client reference and agency codes were extracted from the dataset. Each individual was given a unique study number. The extracted information was sent to the reporting agency along with a request to identify each individual's full name. The agency was asked to post this information to ONS in a pre-addressed, pre-paid envelope provided.

Once ONS had received client information from the reporting agency, death certificates were identified for each individual. The names were removed from death certificates and replaced with the unique study number. The anonymous death certificates, containing cause of death (in accordance with the World Health Organization International Classification of Disease Register version 10, see **www.who.it/classifications/icd/en/**), verdict of inquest (if one took place) and the clients unique study number were returned to the Centre for Public Health, Liverpool John Moores University. Dependent on the ICD 10 code for main and underlying cause of death, individuals were categorised into those who died from a DRD and those from a non DRD (see page two). Individuals, whose deaths were related to benzodiazepine use, where no other drug controlled under the Misuse of Drugs Act was identified, were classified as non DRDs. This classification was adopted because some benzodiazepines are controlled under the Misuse of Drugs Act, and others are not, yet it was impossible to determine from ONS data which specific benzodiazepine was associated with the person's death.

Comparisons between those who died of a DRD and individuals who died of other causes were undertaken using Mann-Whitney U and chi-squared statistical tests for age, gender and injecting history. Mann-Whitney U statistical analysis was also used for comparison of those who died between the six years of the study. These statistical tests were carried out using SPSS version 17.

Results

Deaths in Structured Drug Treatment

Between 1st April 2003 and 31st March 2009 there were 664 confirmed deaths of those in contact with structured treatment services in the North West of England (see table 1). Seven of the 664 individuals had no ICD 10 code for cause of death. Of those confirmed to have died, 512 (77.11%) were male. No inquest was undertaken for 290 of the 664 individuals (43.67%). Of those with an inquest, the verdict of 'misuse of drugs' was recorded in 100 instances, accounting for 26.74% of deaths with a verdict or 15.06% of all recorded deaths.

Table 1: Inquest data for those individuals confirmed as died during April 2003 - March 2009

Verdict	Number	%
Accidental	62	9.34
Misadventure	94	14.16
Misuse of Drugs	100	15.06
Natural	51	7.68
No inquest	290	43.67
Open	30	4.52
Suicide	37	5.57
Total	**664**	**100.00**

Table 2 shows there has been an increase in the number of individuals confirmed dead, year on year from 85 in 2004/05 to 156 in 2008/09. This increase in the number of confirmed deaths may not necessarily be as a result of an increase in the number of mortalities over these years but may be as a result of improvements in the accuracy of agency monitoring systems and cooperation with the study, along with an increase in the number of individuals attending drug treatment during this period.

Table 2: Confirmed deaths for those in contact with structured treatment services, April 2003 - March 2009

Year	Number	%
2003/2004	98	14.76
2004/2005	85	12.80
2005/2006	101	15.21
2006/2007	107	16.11
2007/2008	117	17.62
2008/2009	156	23.49
Total	**664**	**100.00**

According to the drug strategy definition of a DRD, table 3 shows there were 230 (35.01%) DRDs amongst the 657 individuals confirmed to have died with an ICD 10 code on their death certificate. Table 4 shows that, whilst there was a slight increase in the proportion of DRD during 2006/07, there has been little variation in the proportion of DRD across the years.

Table 3: Number of DRD and non DRD amongst those confirmed to have died, April 2003 - March 2009

Cause of death	Number	%
DRD	230	35.01
Non DRD	427	64.99
Total[1]	**657**	**100.00**

Table 4: Number of DRD and non DRD amongst those confirmed to have died, April 2003 - March 2009

Year	DRD		Non DRD		Total
	No.	%	No.	%	
2003/2004	29	29.90	68	70.10	97
2004/2005	30	35.29	55	64.71	85
2005/2006	31	31.00	69	69.00	100
2006/2007	43	40.57	63	59.43	106
2007/2008	41	35.34	75	64.66	116
2008/2009	56	36.60	97	63.40	153
Total	**230**	**35.01**	**427**	**64.99**	**657**

[1] Seven of the 664 individuals had no ICD 10 code for cause of death

Table 5 shows across all years of this study, those who have died of a DRD have been significantly younger (median age 36.83 years, interquartile range 31.18-4.73) when compared to those who have died of a non DRD (median age 41.22 years, interquartile range 35.48-47.89, $p<0.01$).

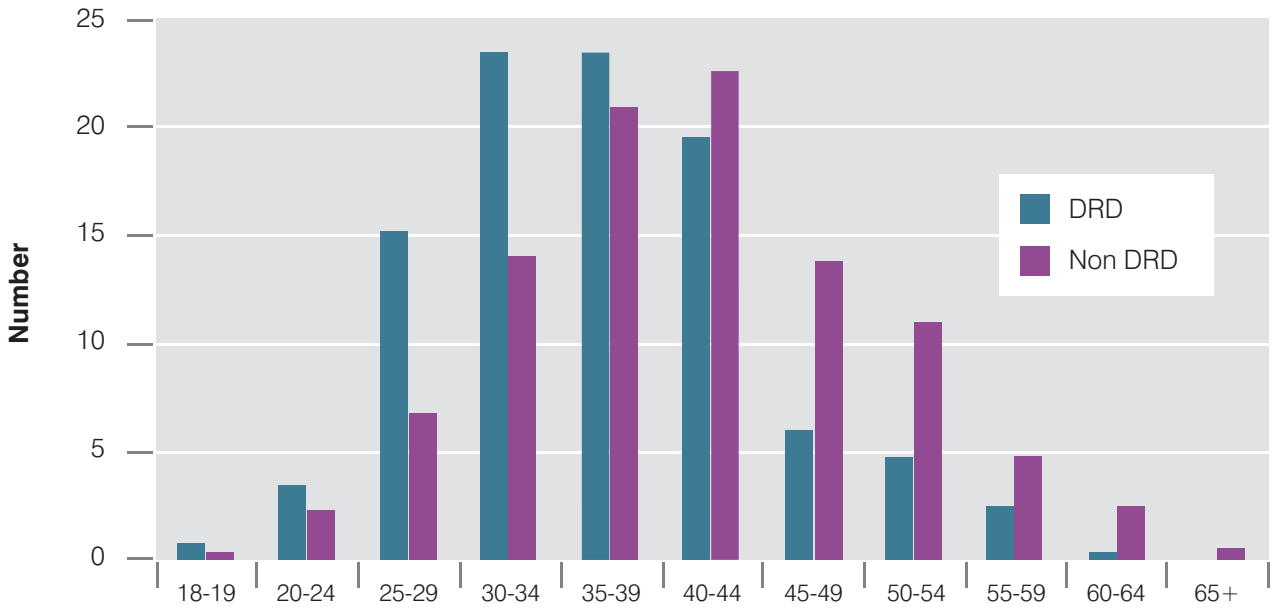
Although those who died were significantly younger in comparison to non DRD, the median age of those who have died has risen with virtually every reporting year, regardless of cause of death. This is consistent with an ageing population with drug treatment (Beynon et al., 2007; Hurst et al., 2010).The median age of those dying from a DRD has risen from 32.72 years in 2003/04 to 39.82 years in 2008/09. During the most recent reporting year, those dying of a non DRD were only, on average, 1.94 years older than those dying of a DRD.

Table 5: Median age of DRD and non DRD, April 2003 - March 2009

Year	Median Age		
	DRD	Non DRD	All deaths
2003/04	32.72	37.74	36.46
2004/05	31.51	39.34	37.58
2005/06	33.28	42.39	38.38
2006/07	39.95	40.62	40.34
2007/08	37.31	43.40	41.38
2008/09[2]	39.82	41.76	41.38
Across years	36.83	41.22	39.51

Figure 1 displays the age of DRD and non DRD. The majority of DRD were aged between 25 and 39 (n=143, 62.17%). In contrast, over half of non DRD were amongst those aged over 40 (n=237, 55.50%).

Figure 1: Age at death of DRD and non DRD, April 2003 - March 2009



[2] One individual in this year did not have a date of death included within their death certificate. Therefore, analysis of age was not possible for this individual

Tables 6 and 7 shows 572 of the 657 (87.06%) individuals confirmed dead had an injecting status reported within their NDTMS record. Of these 572 individuals, 367 (64.16%) stated they were currently injecting, or had previously injected at point of entry into treatment. It should be noted that the data quality of the injecting status field within NDTMS has consistently improved between 2003/04 and 2008/09.

Table 6: Number of deceased individuals with, and without, an injecting history, April 2003 - March 2009

Year	Injector		Non injector		Total
	Number	%	Number	%	
2003/2004	41	53.95	35	46.05	76
2004/2005	37	64.91	20	35.09	57
2005/2006	58	61.70	36	38.30	94
2006/2007	68	68.00	32	32.00	100
2007/2008	65	63.73	37	36.27	102
2008/2009	98	68.53	45	31.47	143
Across years	367	64.16	205	35.84	572

Individuals confirmed to have died with an injecting history were significantly more likely to have died from a DRD in comparison to those without an injecting history (χ^2=10.85, p<0.01).

Table 7: Number of DRD and non DRD by injecting status, April 2003 - March 2009

Injecting status	DRD		Non DRD	
	Number	%	Number	%
Injector	147	73.13	220	59.30
Non injector	54	26.87	151	40.70
Total	**201**	**100.00**	**371**	**100.00**

Table 8 shows cause of death for all those classified as DRD between 2003/04 and 2008/09. The majority of deaths as a result of mental and behavioural disorders from opioid use (F111 and F112, n=60), reflecting the large proportion of individuals in contact with treatment due to heroin use (Hurst et al., 2010).

Table 8: Death classified as DRD, April 2003 - March 2009

ICD 10 code	Underlying cause of death	Total
F111	Mental and behavioural disorders due to the use of opioids, harmful use	18
F112	Mental and behavioural disorders due to the use of opioids, dependence syndrome	42
F141	Mental and behavioural disorders due to the use of cocaine, harmful use	1
F142	Mental and behavioural disorders due to the use of cocaine, dependence syndrome	1
F151	Mental and behavioural disorders due to the use of other stimulants including caffeine, harmful use	1
F191	Mental and behavioural disorders due to multiple drugs use and the use of other psychoactive substances, harmful use	15
F192	Mental and behavioural disorders due to multiple drugs use and the use of other psychoactive substances, dependence syndrome	48
X41*	Accidental poisoning by, and exposure to, antiepileptic, sedative hypnotic, antiparkinsonism and psychotropic substances, not elsewhere classified	1
X42*	Accidental poisoning by, and exposure to, narcotics and psychodysleptics (hallucinogens), not elsewhere classified	68
X44*	Accidental poisoning by, and exposure to, other and unspecified drugs medicaments and biological substances	22
X62*	Intentional self-poisoning by drugs, medicaments and biological substances	3
X64*	Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances	1
Y11*	Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified, undetermined intent	1
Y12*	Poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified, undetermined intent	4
Y14*	Poisoning by and exposure to other and unspecified drugs, medicaments and biological substances, undetermined intent	3
F18*	Mental and behavioural disorders due to the use of volatile solvents	1
Total		**230**

* Accompanied by an ICD 10 code indicating the involvement of a drug controlled under the Misuse of Drugs Act 1971

Table 9 displays the cause of death for those classified as DRD between 2003/04 and 2008/09. Whilst there were two deaths as a result of cocaine use during 2006/07 and 2007/08, there were no deaths as a result of this drug during 2008/09, with the majority of deaths occurring as a result of opioid use, either alone or in combination with other substances, across all years of the study. This is consistent with np-SAD coroners reporting of DRD in England which found that opiates/opioids (i.e. heroin/morphine; methadone; other opiates/opioid analgesics), alone or in combination with other drugs, accounted for the majority (69%) of all np-SAD cases (Ghodse et al., 2009).

Table 9: Deaths classified as DRD, April 2003 - March 2009

ICD 10 code[3]	Year						Total
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	
F11	6	12	8	13	10	11	60
F14	0	0	0	1	1	0	2
F15	1	0	0	0	0	0	1
F19	12	7	10	13	10	11	63
X41	1	0	0	0	0	0	1
X42	4	9	9	8	14	24	68
X44	5	1	1	3	3	9	22
X62	0	0	1	0	2	0	3
X64	0	0	0	0	1	0	1
Y11	0	0	0	1	0	0	1
Y12	0	0	2	2	0	0	4
Y14	0	0	0	2	0	1	3
F18	0	1	0	0	0	0	1
Total	**29**	**30**	**31**	**43**	**41**	**56**	**230**

[3] Only two digit codes are presented here (see page two for details of the codes)

Table 10 displays the cause of death for all those classed as a non DRD. It also displays the injecting history of those who died between 2003/04 and 2008/09. There were a large number of deaths caused by diseases of the liver (n=82), neoplasms (n=53), accidents (n=33), intentional self harm (n=32) and chronic lower respiratory diseases (n=32).

Table 10: Death classified as non DRD, with injecting status, April 2003 - March 2009

Mortality category	Injector	Non injector	Total[4]
Tuberculosis	1	1	2
Other bacterial diseases	3	1	4
Viral hepatitis	13	9	25
HIV	1	0	1
Mycoses	0	2	2
Malignant neoplasms	29	22	53
Other diseases of blood and blood forming organisms	1	1	2
Diabetes mellitus	2	1	5
Mental and behavioural disorders due to substance use	1	1	3
Behavioural syndromes associated with physiological disturbances and physical factors	0	0	1
Inflammatory diseases of the CNS	1	0	2
Episodic and paroxysmal disorders	1	1	2
Other disorders of the CNS	0	1	1
Chronic rheumatic heart disease	0	1	1
Hypertensive diseases	1	0	1
Ischaemic heart disease	8	7	18
Pulmonary heart disease and disease of pulmonary circulation	1	0	1
Other forms of heart disease	14	1	18
Cerebrovascular disease	14	5	21
Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified	2	2	4
Influenza and pneumonia	11	8	22
Other acute lower respiratory infections	0	1	2
Chronic lower respiratory diseases	13	14	32
Other respiratory diseases principally affecting the interstitium	0	1	1
Suppurative and necrotic conditions of the lower respiratory tract	3	1	5
Other diseases of the respiratory system	0	1	1
Diseases of oesophagus, stomach and duodenum	2	1	3
Non infective enteris and colitis	1	1	3
Other diseases of the intestines	1	0	3
Diseases of the peritoneum	1	0	1
Diseases of the liver	46	28	82
Disorders of the gallbladder biliary tract and pancreas	2	1	3
Infections of the skin and subcutaneous tissue	2	1	3
Other disorders of the skin and subcutaneous tissue	1	0	1
Arthropathies	1	0	1
Osteopathies and chondropathies	0	1	1
Glomerular diseases	0	1	1
Ill defined and unknown causes of mortality	8	0	9
Accidents	13	15	33
Intentional self harm	11	15	32
Assault	1	0	1
Events of undetermined intent	9	5	19
Sequele of external causes of morbidity and mortality	1	0	1
Total	**220**	**151**	**427**

[4] The total includes those with an unknown injecting status, along with those with and without an injecting history

Table 11 shows there has been an increase in the number, and proportion of deaths as a result of diseases of the liver between 2003/04 (n=8, 11.76%) and 2008/09 (n=23, 23.71%). There has also been an increase in deaths as a result of viral hepatitis between these years, with the number of related incidences of mortality rising between 2003/04 and 2004/05 and remaining consistent up to 2008/09. There has been an increase in the incidence of accidents from four in 2007/08 to 10 in 2008/09 and in self harm between these two years (n=3 in 2007/08, n=8 in 2008/09).

Table 11: Death classified as non DRD, April 2003 - March 2009

Mortality category	Year					
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Tuberculosis	0	0	1	0	1	0
Other bacterial diseases	2	1	0	0	1	0
Viral hepatitis	1	6	5	4	3	6
HIV	0	0	0	0	1	0
Mycoses	1	0	0	0	1	0
Malignant neoplasms	8	4	7	11	15	8
Other diseases of blood and blood forming organs	1	0	0	0	1	0
Diabetes mellitus	2	1	0	0	0	2
Mental and behavioural disorders due to psychoactive substances[5]	1	0	0	0	0	2
Behavioural syndromes associated with physiological disturbances and physical factors	0	0	0	0	0	1
Inflammatory diseases of the CNS	0	1	0	0	0	1
Episodic and paroxysmal disorders	0	0	0	0	1	1
Other disorders of the CNS	0	1	0	0	0	0
Chronic rheumatic heart disease	0	0	0	0	0	1
Hypertensive diseases	0	0	0	1	0	0
Ischaemic heart diseases	4	3	2	4	2	3
Pulmonary heart disease and disease of pulmonary circulation	0	0	1	0	0	0
Other forms of heart disease	3	1	4	0	4	6
Cerebrovascular diseases	2	3	5	4	4	3
Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified	1	0	1	0	1	1
Influenza and pneumonia	6	4	4	2	3	3
Other acute lower respiratory infections	1	0	0	0	1	0
Chronic lower respiratory diseases	5	3	5	6	5	8
Other respiratory diseases principally affecting the interstitium	0	0	0	0	1	0
Suppurative and necrotic conditions of lower respiratory tract	0	2	1	2	0	0
Other diseases of the respiratory system	0	0	1	0	0	0
Diseases of the oesophagus, stomach and duodenum	0	0	2	0	1	0
Non-infective enteris and colitis	1	0	0	1	1	0
Other diseases of the intestines	0	0	0	1	1	1
Diseases of the peritoneum	0	0	0	0	0	1
Diseases of the liver	8	9	14	11	17	23
Disorders of the gallbladder, biliary tract and pancreas	0	0	1	1	0	1
Infections of the skin and subcutaneous tissue	1	0	0	0	1	1
Other disorders of skin and subcutaneous tissue	0	0	0	1	0	0
Arthropies	0	1	0	0	0	0
Osteopathies and chondropathies	0	0	0	1	0	0
Glomerular diseases	0	0	0	0	0	1
Ill-defined and unknown causes of mortality	1	1	2	2	2	1
Accidents	4	5	7	3	4	10
Intentional self harm	7	5	3	6	3	8
Assault	0	0	0	1	0	0
Events of undetermined intent	8	4	3	0	0	4
Sequele of external causes of morbidity and mortality	0	0	0	1	0	0
Total	**68**	**55**	**69**	**63**	**75**	**97**

[5] Not included with DRD category as death was coded to F18 category (mental and behavioural disorders due to the use of volatile solvents) with no mention of a controlled drug (under the Misuse of Drugs Act) in the death record

Deaths in Structured Alcohol Treatment

This study was extended to alcohol specific treatment services in 2008/09. Table 12 shows there were 45 confirmed deaths amongst those in contact with alcohol treatment (identified as individuals who stated the primary use of alcohol within NDTMS). A slightly higher proportion of individuals confirmed dead within alcohol treatment were female (37.78%) when compared with deaths in drug treatment (22.89%). This is consistent with a larger proportion of females accessing alcohol treatment as a whole when compared to drug treatment (Hurst et al., 2010).

Table 12: Number of confirmed deaths in alcohol treatment, April 2003 - March 2009

Sex	Total	%
Female	17	37.78
Male	28	62.22
Total	**45**	**100.00**

The majority of individuals within this cohort were aged 40 years and older at death (65.91%), with few deaths occurring amongst those in alcohol treatment aged under 25 (see figure 2). Individuals who died whilst in contact with structured alcohol treatment were significantly older at death (median age 47.13 years, interquartile range 38.08-58.45) when compared to those in contact with drug treatment (median age 39.51 years, interquartile range 33.65-45.46, $p<0.001$), consistent with an older population within alcohol treatment in comparison to drug treatment (Hurst et al., 2010).

Figure 2: Age at death of drug (April 2003 - March 2009) and alcohol clients (April 2008 - March 2009)

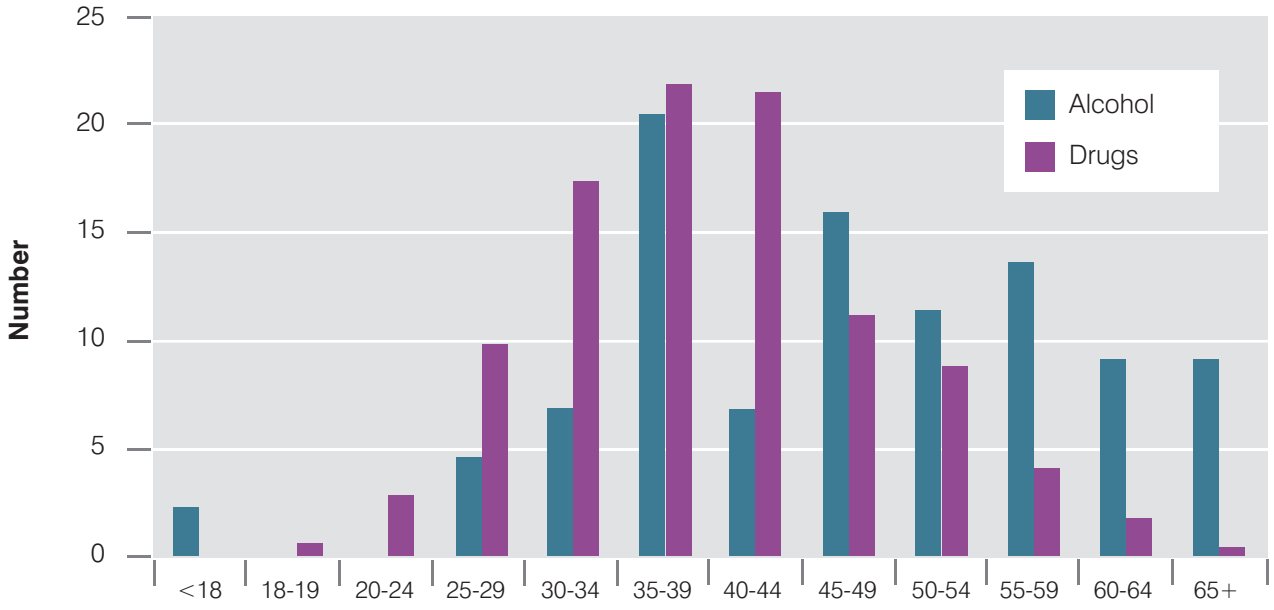


Table 13 displays the cause of death for those in contact with alcohol treatment. Of the 45 confirmed deaths, 13 (28.89%) were as a result of diseases of the liver. Of these 13 deaths, 10 were as a result of alcoholic liver disease. There were four deaths as a result of mental and behavioural disorders due to substance use, two of which were due to the use of alcohol.

Table 13: Cause of death amongst individuals in alcohol treatment, April 2003 - March 2009

Mortality category	Number	%
Organic, including symptomatic mental disorders	1	2.22
Mental and behavioural disorders due to psychoactive substance use	4	8.89
Inflammatory disorders of the CNS	2	4.44
Other disorders of the nervous system	1	2.22
Ischaemic heart diseases	4	8.89
Cerebrovascular diseases	1	2.22
Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified	1	2.22
Influenza and pneumonia	2	4.44
Chronic lower respiratory diseases	1	2.22
Diseases of the liver	13	28.89
Disorders of the gallbladder, biliary tract and pancreas	5	11.11
Accidents	6	13.33
Intentional self harm	2	4.44
Events of undetermined intent	2	4.44
Total	**45**	**100.00**

Summary

Demographics of DRD and non DRD

Between 2003/04 and 2008/09 there have been 664 confirmed deaths within structured drug treatment services in the North West of England, the majority would not be classed as a DRD, a pattern that remained consistent across the six years of the study. Those who were identified as having died as a result of a DRD were significantly younger, and more likely to have had a history of IDU in comparison to those dying of a non DRD. Opiate using IDUs are at more risk of overdose in comparison to non-injecting drug users due to the rapid onset of peak levels of this drug, in particular when used in combination with other Central Nervous System (CNS) depressants. Those dying of a DRD may have been significantly younger when compared to those dying of a non DRD because younger injectors are at more risk of overdose when compared to their older counterparts (Seal et al., 2001). Furthermore, the susceptibility of older drug uses to long term conditions, results in a higher proportion of non DRDs among older drug treatment clients (Beynon et al., 2010).

Whilst those dying from a DRD were significantly younger at time of death in comparison to those dying of a non DRD, the median age of both cohorts has increased with each reporting year. This is consistent with an ageing treatment population in the North West; the proportion of individuals in contact with drug treatment aged 40 years and older has increased from 15.88% in 2003/04 to 30.78% in 2009/10 (Beynon et al., 2007; Hurst et al., 2010). An ageing treatment population could have important public health implications as the cost of treating chronic conditions as a result of long term drug and alcohol use could be considerable. In an investigation of health status amongst older drug users, Beynon et al. (2009) found that in general, drug users aged over 50 had poor levels of physical and mental health, supporting the premise that substance use into older age exacerbates, or accelerates, the onset of medical conditions which are more prevalent in older age. Non DRD amongst an ageing treatment population will increase as those in service die from long term conditions which are a likely result of chronic drug use coupled with the impact of social deprivation. Whilst the ageing population will impact on the number of non DRD in drug treatment, it should also be noted that the median age of those dying of DRD in service has also risen between 2003/04 and 2008/09.

The NTA Harm Reduction Works campaign (**www.harmreductionworks.org.uk**) targets all users and provides harm reduction and overdose materials for young people and adults. This campaign was developed as part of the implementation of the Department of Health publication, Reducing Drug Related Harm: An Action Plan (**www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_074850**). These significant resources are dedicated to reducing DRD and should be used to assist in providing messages to all those in treatment, including those who may have been in service for a number of years.

Viral Hepatitis

Between 2003/04 and 2008/09 there were 25 confirmed deaths as a result of viral hepatitis, the majority of which were as a result of hepatitis C infection. Hepatitis C virus (HCV) is thought to be the most important virus affecting those who inject drugs in the UK (HPA, 2009a). It is estimated that approximately 185,000 individuals are chronically infected with HCV in the UK (HPA, 2009b). Much of the prevalent infection is concentrated in marginalised populations, with IDUs at the greatest risk of acquiring infection. Information from laboratory confirmed diagnoses of HCV infection between 1996 and 2008 found that 90% of infected individuals reported IDU as a risk factor for infection. Antiviral treatments are available that will successfully clear the HCV virus in more than half of those treated. However, unless there is a major increase in those receiving effective treatment, it is anticipated that the future burden of HCV related disease is likely to be substantial, with all national data sources showing that HCV related liver disease continuing to increase year-on-year (HPA, 2009). The HPA and ACMD recommend that commissioners and providers ensure a high rate of testing amongst those attending specialist services for drug users, with lead agencies ensuring widespread access to testing HCV using alternative specimens (e.g. oral fluid and dried blood spot tests, HPA, 2009a, ACMD, 2009). The 2008/09 NDTMS national data revealed that just under half of all injectors (current or previous) in treatment were recorded as having had a hepatitis C test (46.9%), with a slightly smaller proportion of all injectors newly presenting to treatment recorded as having had

the test (45.4%, HPA, 2009). The Unlinked Anonymous Survey of HIV and Hepatitis in Injecting Drug Users (UAPMP) indicates that an increasing proportion of IDUs with HCV are aware of their infection indicating progress toward one of the aims of the 'Hepatitis C Action Plan for England' (DH, 2004). In 2008, only 23% of IDUs who took part in the UAPMP reported never having had a voluntary HCV test compared to 51% in 2000 (HPA, 2009b). Due to the high rate of HCV amongst IDUs in the UK, and the relatively high proportion of those dying as a result of this virus within this study, it is important that the level of HCV testing amongst those in contact with drug treatment continues to rise so that individuals with the virus are aware of their positive status and can seek treatment. According to NDTMS, of the five individuals who died as a result of hepatitis C during 2008/09, only one was recorded as having had a hepatitis C test date and none were recorded as having been offered a hepatitis C test whilst in treatment.

Amongst the 25 deaths as a result of viral hepatitis were eight incidences of hepatitis B infection. In the UK, this infection is usually acquired via sexual activity or IDU. The hepatitis B virus typically causes an acute infection, with a small number of those infected going on to develop chronic disease (HPA, 2008b). Infection with hepatitis B is, however, preventable, using a safe and effective vaccine. The incidence of hepatitis B in IDUs appears to have declined in recent years, with approximately one in six IDUs having had hepatitis B infection. In 2008, 13% of the current and former IDUs who took part in the UAPMP survey had antibodies to hepatitis B core antigen (a marker of previous or current hepatitis B infection); this was lower than the level that had been seen since 1995 (HPA, 2009b). However, the transmission of hepatitis B continues, even though there is an effective vaccine, highlighting the importance of vaccination amongst those in contact with drug treatment. The NTA reinforce this with the Harm Reduction Works campaign (**www.harmreductionworks.org.uk**), it has dedicated materials to promote BBV testing and vaccination, including the importance of vaccination to IDUs to give them hepatitis B immunity. The proportion of IDUs reporting uptake of hepatitis B vaccination has increased over the last decade, with over two-thirds now reporting that they had accepted at least one vaccine dose (HPA, 2009b).

Liver Disease

A high proportion of non DRD were as a result of liver disease (n=82, 19.20%) with 65 of the 82 deaths due to alcoholic liver disease. The number and proportion of deaths from liver disease has increased between 2003/04 and 2008/09, with 23 incidences in 2008/09 alone. Problem alcohol use is associated with adverse health outcomes and is a common problem among people who use heroin and other illicit opiates. Alcohol is one of the most frequently reported secondary substances for those in contact with drug treatment (Hurst et al., 2010), with high levels of reported alcohol use amongst those in contact with various types of structured drug treatment (McCusker, 2001; Ryder et al., 2009). The National Treatment Outcome Research Study (NTORS) found that 33% of those entering residential treatment or community methadone programmes were drinking at levels above those recommended as safe, and at follow-up a year later a substantial proportion were still doing so. The proportion of drug users treated in the community drinking above safe limits (23%) did not alter over the year, nor did the proportion drinking daily (11%, Gossop et al. 2002). High levels of alcohol consumption can have adverse health implications amongst those in contact with drug treatment. Problem alcohol use is an important factor in determining poor prognosis among people with hepatitis C infection as lifetime consumption of alcohol and occasional heavy alcohol drinking have been shown to play an additive role in determining progression to hepatic cirrhosis (Poynard et al., 1997). The results presented here suggest that alcohol use within the drug treatment population is a continuing problem and highlights the need to address this associated issue. The interaction between drug and alcohol use was emphasised by matching the NDTMS dataset in 2008/09, six individuals confirmed to have died in drug treatment were also in contact with alcohol treatment services (included within drug treatment analysis in this study). Three of the six individuals died from alcoholic liver disease.

Whilst the reduction of alcohol consumption is of particular importance in the prevention of liver disease, reductions in alcohol use form part of strategies to reduce DRDs, because alcohol is known to play a role in cases of fatal opiate overdose (White & Irvine, 1999) and other deaths where a person has consumed central nervous system depressants (Darke & Zador, 1996).

Influenza, pneumonia and other bacterial infections

IDUs are susceptible to a range of bacterial infections such as Staphylococcus aureus, Group A streptococci and Clostridia (HPA, 2009b) as a result of non-sterile injecting or injecting contaminated drugs. In recent years these acute infections have caused growing public health problems. Symptoms of a possible injecting-site infection would appear to be common among IDUs, as 31% of IDUs participating in the UAPMP survey in 2008 reported they had experienced an abscess, sore or open wound, possible symptoms of an injecting-site infection, during the previous year. The reporting of such a symptom was associated with having been homeless in the last year, with 34% of those homeless during the last year reporting a symptom, compared with 29% of those not homeless.

Whilst injection related bacterial infections can be found at subcutaneous sites of injection such as celluitis (Swartz et al., 2004), bacterial infections can also cause a number of conditions away from the injection site, such as septicaemia, pneumonia and endocarditis (Miro et al., 2003). There were eight incidences of endocarditis within this study, with two during 2008/09, all had a history of IDU. There were also 22 incidences of influenza and pneumonia. Drug users are particularly susceptible to aspiration pneumonia caused when bacteria are allowed to enter the lungs when a person's normal coughing and sneezing mechanisms are depressed through use of alcohol and/or drugs that suppress the CNS (Gotway et al., 2002). The number of deaths due to pneumonia and bacterial infections, which have remained consistent throughout all years of the study, suggest that the provision of harm reduction to prevent infection, in particular amongst IDUs is important for those in contact with structured drug treatment. It is also important that all drug services have links with primary care services to ensure that any infection can be treated before it becomes systemic and potentially life threatening. The NTA Harm Reduction Works campaign (**www.harmreductionworks.org.uk**) supports this, providing a resource of materials relating to safer injecting. This site details information designed to target specific causes of injecting related harm including poor injecting technique, poor hand hygiene and poor injecting site hygiene. In addition, advice is available to femoral injectors to understand the damage that is caused, and the symptoms that signal serious damage.

Anthrax outbreak

Between December 2009 and March 2010 there were a number of public health warnings regarding an outbreak of anthrax (Bacillus anthracis) amongst injecting drug users in Scotland, England (specifically London and Blackpool) and Germany, confirmed through forensic analysis. In response to this outbreak frequent letters were written from the Chief Medical Officer for Scotland providing information, guidance and advice for medical personnel, drug treatment services, ambulance services and the Crown Office (Burns, 2010). Guidance for those working with heroin users to help identify individuals who may be infected with anthrax and the steps to be taken in a suspected case was also distributed to all relevant agencies. Guidance stated that health professionals should be aware of potential infection amongst injecting drug users presenting with severe soft tissue infections or sepsis (Cole et al., 2010).

Other respiratory diseases and diseases of the circulatory system

Between 2003/04 and 2008/09 there were 32 deaths as a result of chronic lower respiratory disease, a high incidence of this cause of mortality occurring in the most recent reporting year. These deaths may have been as a result of smoking crack cocaine, which is often linked to respiratory complications due to its mode of use (Devlin & Henry, 2008) or cigarette smoking.

In addition to deaths from endocarditis, there were a number of deaths from causes related to the pulmonary and vascular system. Over the six years of the study, there were four deaths as a result of deep vein thrombosis (DVT). The vascular complications of injecting drug use tend to arise after prolonged drug misuse, with venous thrombosis usually occurring after many years of self injection, when available superficial veins have become thrombosed (Mackenzie et al., 2000). This suggests that individuals dying of DVT within this cohort had been injecting for a number of years prior to death. This highlights the importance of harm reduction messages amongst IDUs within structured treatment including raising awareness of safer injecting practices, assessment of injection-site infections, advice on preventing overdoses and help to stop injecting drugs (NICE, 2009).

Intentional self harm and accidents

Within the non DRD cohort there were 32 deaths as a result of intentional self harm, eight of which occurred in 2008/09 alone. There were also 19 deaths as a result of 'events of undetermined intent', some of which may have been suicides but where the coroner may not have been completely sure that the person had intended to take their own life. Studies consistently report more than 5% of heroin user deaths as due to suicide and in many studies the figure is more than 10% (Darke et al., 2006; Darke & Ross, 2002; Maxwell et al., 2005; Rehm et al., 2005). Opioid dependence is associated with a completed suicide risk 14 times that of the general population (Harris & Barraclough, 1997; Wilcox et al., 2004). In a recent study of outcomes for the treatment of heroin dependence it was found that attempted suicide rates did not significantly decline in the 12 months following treatment entry, regardless of treatment modality (Darke et al., 2005a). Whilst drug treatment appeared to be making a large impact upon drug use and a range of drug-related problems, in the medium term it did not significantly reduce rates of attempted suicide. However, after three year follow up there were greater reductions in attempted suicide amongst those in contact with treatment. Significant declines in suicide rates across the 3 years of follow-up were seen amongst both genders. Despite substantial improvements in suicidality and mental health, rates of attempted suicide and suicidal ideation remained higher than that of the general population. It is likely that the greater level of stability seen amongst the cohort as a result of drug treatment was reflected in reduced suicidality (Darke et al., 2007).

Deaths in alcohol treatment

In April 2008, the National Treatment Agency (NTA) expanded NDTMS to collect tier 3 and 4 alcohol data from specialist alcohol treatment agencies. As a result of this expansion in NDTMS data collection, causes of death of those in contact with alcohol treatment during 2008/09 have been included within this report. Those who died whilst in contact with alcohol treatment were significantly older at death when compared to those in contact with structured drug treatment, a pattern consistent with the overall treatment population. A total of 13 deaths occurred as a result of diseases of the liver (28.89%), a higher proportion when compared to those who died whilst in drug treatment (n=82, 19.20%). Of these 13 deaths, 10 were as a result of alcoholic liver disease. There were also two deaths as a result of mental and behavioural disorders due to the use of alcohol. Along with deaths directly attributable to alcohol consumption, other deaths occurred amongst this cohort which may be, in part, attributable to alcohol consumption such as acute pancreatitis, influenza and pneumonia and transport accidents (see appendix II). Death disorders directly linked to alcohol consumption (such as alcoholic liver cirrhosis, alcoholic pancreatitis, alcoholic gastritis, alcohol poisoning and alcoholic cardiomyopathy) are increasing in the United Kingdom whilst they are declining in several other countries in Europe (Leon & McCambridge, 2006; ONS, 2010). Despite attempts to inform the public about safe levels of alcohol consumption, alcohol continues to be used harmfully with approximately 38% of men and 16% of women aged 16 to 64 years having an alcohol use disorder, which is equivalent to approximately 8.2 million people in England (DH, 2004). The continuation of the study into deaths of those in contact with alcohol treatment will lead to further understanding of causes of mortality of this population, along with the possible public health implications of the rising number of individuals chronically affected by alcohol consumption.

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Appendix I

Definition of alcohol-related death (ONS, 2010)

Underlying cause of death	ICD 10 code
Mental and behavioural disorders due to the use of alcohol	F10
Degeneration of nervous system due to alcohol	G31.2
Alcoholic polyneuropathy	G62.1
Alcoholic cardiomyopathy	I42.6
Alcoholic gastritis	K29.2
Alcoholic liver disease	K70
Chronic hepatitis, not elsewhere classified	K73
Fibrosis and cirrhosis of the liver	K74 (excluding K74.3-K74.5 biliary cirrhosis)
Alcohol induced chronic pancreatitis	K86.0
Accidental poisoning by and exposure to alcohol	X45
Intentional self-poisoning by and exposure to alcohol	X65
Poisoning by and exposure to alcohol, undetermined intent	Y15

Appendix II

NI 39 - Rate of hospital admissions per 100,000 for alcohol related harm

The Strategy Unit report (Cabinet Office/Strategy Unit, 2003) presented Alcohol Attributable Fractions for 53 conditions, of which 11 were fully attributed to alcohol use and 42 where alcohol was believed to be a contributory factor. AAFs were adapted from the International Guide for monitoring alcohol consumption and related harm (2000) published by the World Health Organisation (WHO). For this report, AAFs were calculated for conditions where there was sufficient evidence in the recent epidemiological literature of a causal relationship between alcohol consumption and the disease or injury.

Alcohol specific

Underlying cause of death	ICD 10 code
Methanol poisoning	T511
Mental and behavioural disorders due to use of alcohol	F10
Ethanol poisoning	T510
Degeneration of nervous system due to alcohol	G312
Alcohol-induced pseudo-Cushing's syndrome	E244
Alcoholic polyneuropathy	G621
Alcoholic myopathy	G721
Alcoholic liver disease	K70
Alcoholic gastritis	K292
Alcoholic cardiomyopathy	I426
Accidental poisoning by and exposure to alcohol	X45

Alcohol-attributable

Underlying cause of death	ICD 10 code
Accidental exposure to excessive cold	X31
Acute pancreatitis	K85
Air/space transport accidents	V95-V97
Alcohol-induced chronic pancreatitis, other chronic pancreatitis	K860-K861
Assault	X93-X99, Y00-Y09
Chronic liver disease	K73-K74
Diabetes mellitus	E10-E14
Drowning	W65-W74
Epilepsy and Status epilepticus	G40-G41
Fall injuries	W00-W19
Fire injuries	X00-X09
Firearm injuries	W32-W34
Gastric ulcer	K25-K27
Gastro-oesophageal laceration-haemorrhage syndrome	K226
Heart failure	I50-I51
Hypertensive diseases	I10-I15
Inhalation and ingestion of food causing obstruction of respiratory tract	W79
Intentional self-harm/Event of undetermined intent	X60-X84, Y10-Y33
Ischaemic heart disease	I20-I25
Malignant neoplasm of breast	C50
Malignant neoplasm of larynx	C32
Malignant neoplasm of lip	C00
Malignant neoplasm of liver and intrahepatic bile ducts	C22
Malignant neoplasm of oesophagus	C15
Malignant neoplasm of oral cavity and pharynx	C01-C14
Malignant neoplasm of other digestive organs	C17-C21
Malignant neoplasm of stomach	C16
Oesophageal varices	I85
Pneumonia and influenza	J12-J18
Psoriasis	L40 excluding L405
Road accidents	V01-V89
Spontaneous abortion	O03
Stroke	I60-I69
Supra ventricular cardiac arrhythmias, atrial fibrillation and flutter	I470-I471, I479, I48
Tuberculosis	A15-A19
Water transport accidents	V90-V94
Work/machine injuries	W24-W31

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ISBN: 978-1-907441-64-6 (print version)
ISBN: 978-1-907441-65-3 (web version)

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