

PARACETAMOL OVERDOSE AND POISONING

Map 19a: Variation in rate of hospital admissions where the primary diagnosis is paracetamol overdose per population by CCG (2013/14 – 2014/15)

Directly standardised rate per 100,000

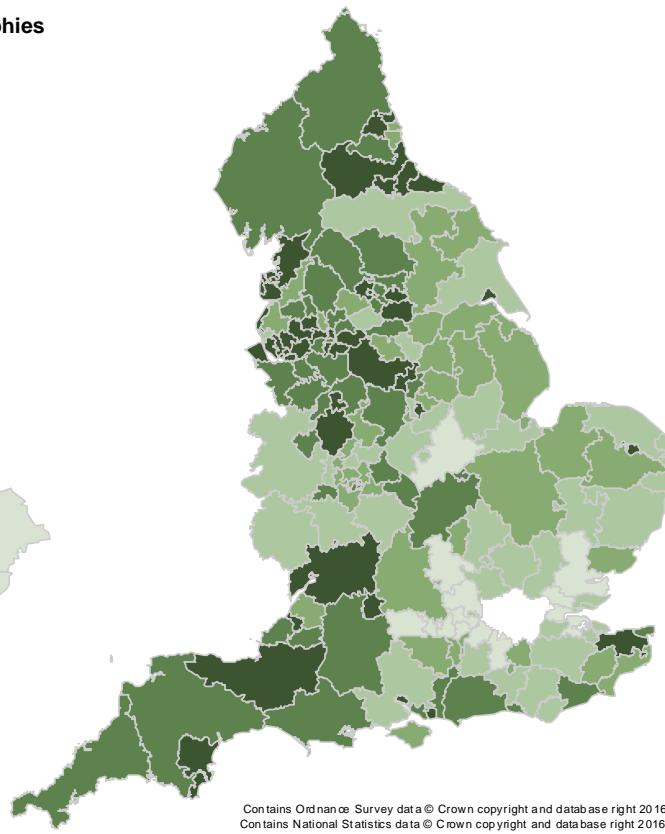
NHS Domain 1: Preventing people from dying prematurely
 NHS Domain 3: Helping people to recover from episodes of ill health or following injury
 PHOF Domain 4: Healthcare public health and preventing premature mortality

OPTIMUM VALUE: LOW

Equal-sized quintiles of geographies

- Highest (127.40 - 304.92)
- (108.24 - 127.39)
- (90.45 - 108.23)
- (63.44 - 90.44)
- Lowest (30.65 - 63.43)

LONDON

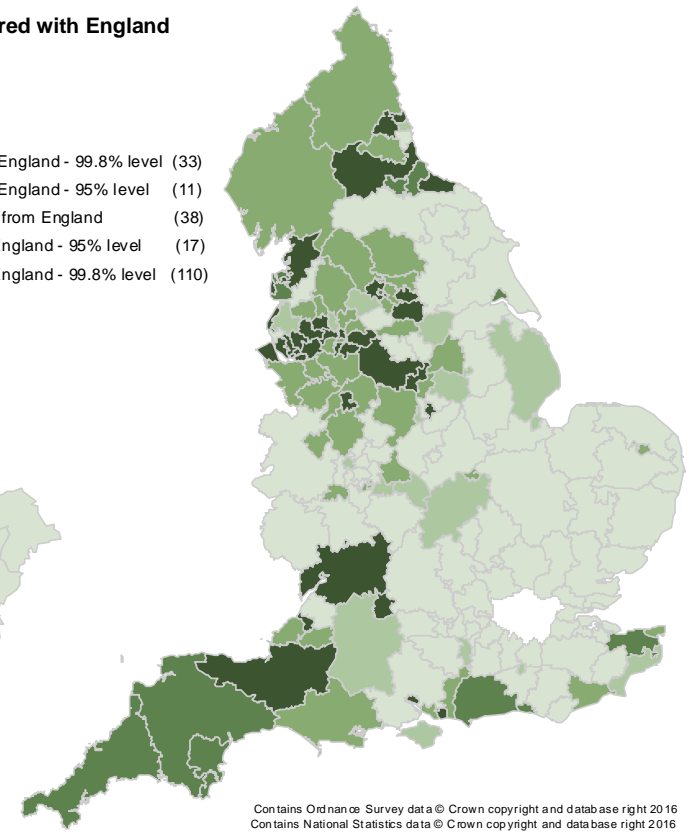


Contains Ordnance Survey data © Crown copyright and database right 2016
 Contains National Statistics data © Crown copyright and database right 2016

Significance level compared with England

- Significantly higher than England - 99.8% level (33)
- Significantly higher than England - 95% level (11)
- Not significantly different from England (38)
- Significantly lower than England - 95% level (17)
- Significantly lower than England - 99.8% level (110)

LONDON



Contains Ordnance Survey data © Crown copyright and database right 2016
 Contains National Statistics data © Crown copyright and database right 2016

PARACETAMOL OVERDOSE AND POISONING

Map 19b: Variation in percentage of deaths from paracetamol poisoning per hospital admissions for paracetamol overdose by region (2012-2014)

NHS Domain 1: Preventing people from dying prematurely

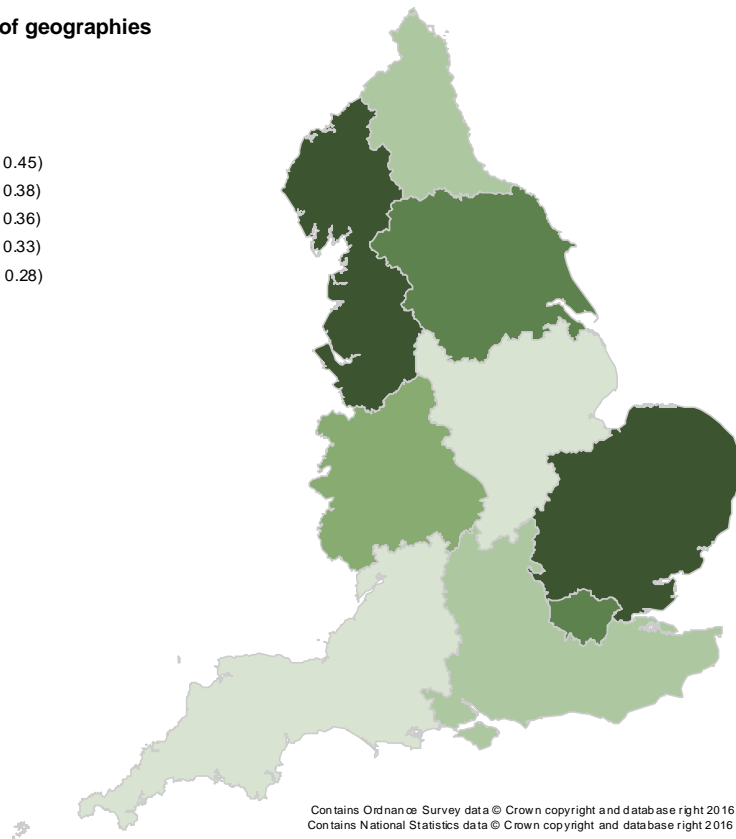
NHS Domain 5: Treating and caring for people in a safe environment and protecting them from avoidable harm

PHOF Domain 4: Healthcare public health and preventing premature mortality

OPTIMUM VALUE: LOW

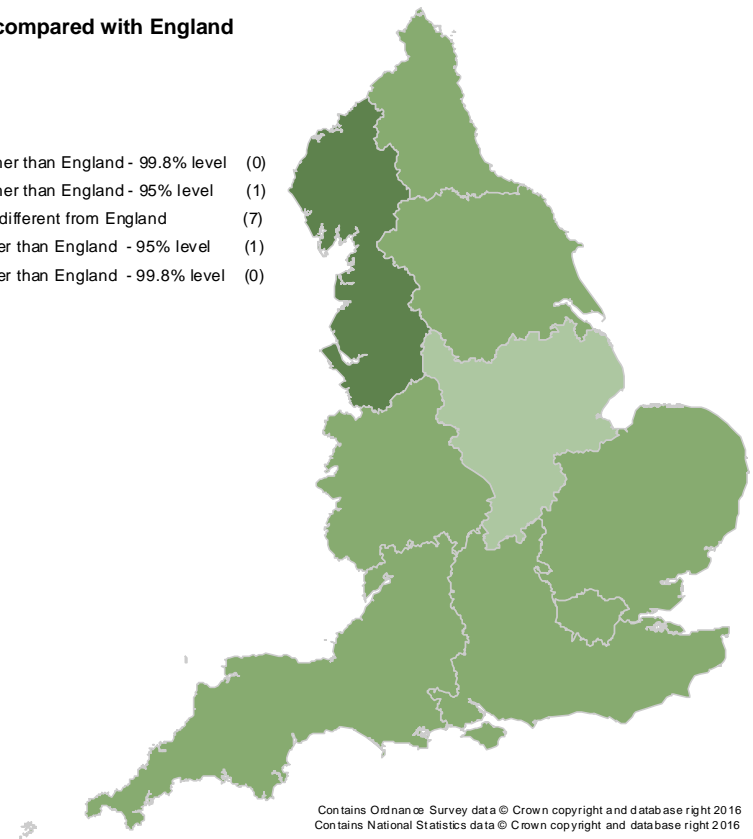
Equal-sized quintiles of geographies

- Highest (0.39 - 0.45)
- (0.36 - 0.38)
- (0.34 - 0.36)
- (0.29 - 0.33)
- Lowest (0.23 - 0.28)

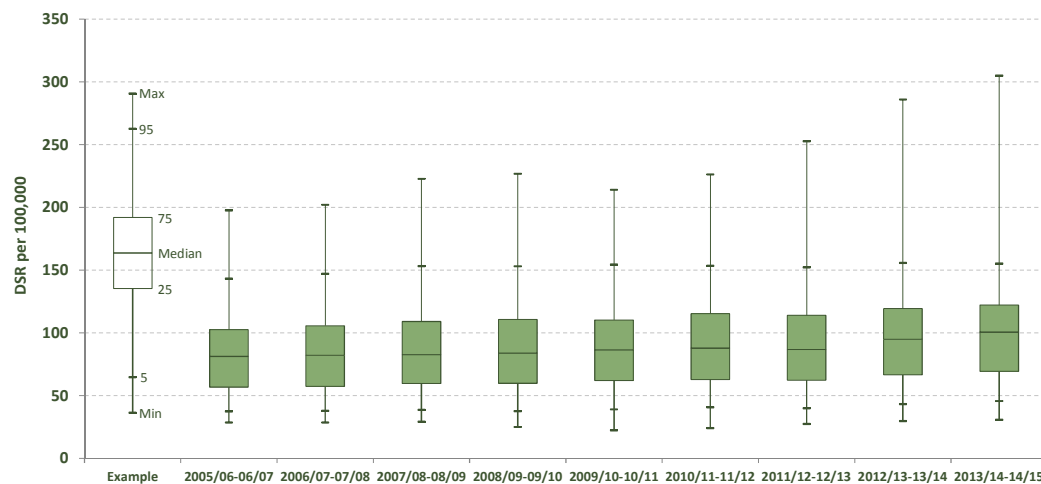
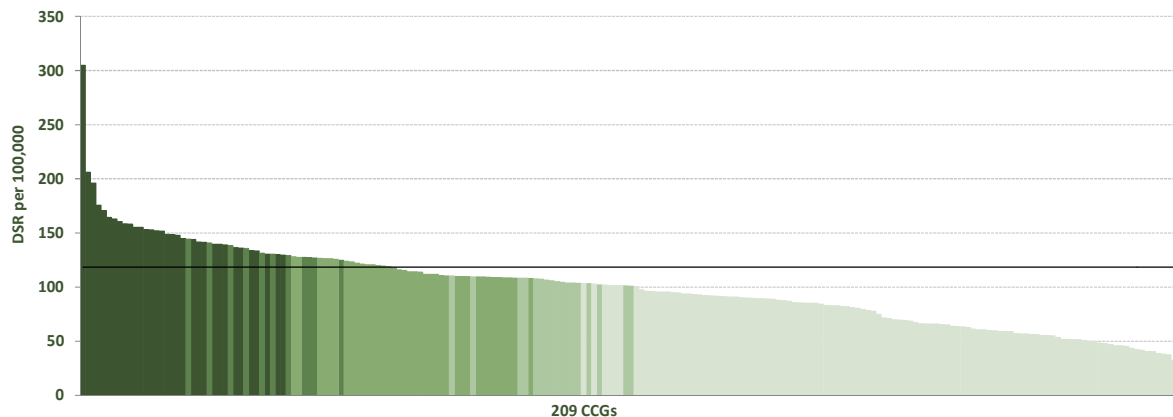


Significance level compared with England

- Significantly higher than England - 99.8% level (0)
- Significantly higher than England - 95% level (1)
- Not significantly different from England (7)
- Significantly lower than England - 95% level (1)
- Significantly lower than England - 99.8% level (0)



Variation in rate of hospital admissions where the primary diagnosis is paracetamol overdose per population by CCG (2013/14 - 2014/15)



	Example	2005/06-07	2006/07-08	2007/08-09	2008/09-10	2009/10-11	2010/11-12	2011/12-13	2012/13-14	2013/14-15	
Max-Min (Range)		169.0	173.5	193.5	201.8	191.8	202.1	225.1	256.2	274.3	WIDENING Significant
95th-5th percentile		105.8	109.3	114.6	115.6	115.5	112.7	112.4	112.6	109.8	No significant change
75th-25th percentile		45.8	48.3	49.4	50.9	48.3	52.4	51.7	52.8	52.8	WIDENING Significant
Median		81.3	82.1	82.7	83.9	86.5	87.8	86.8	94.8	100.7	INCREASING Significant

Context

Paracetamol is the most common drug taken in overdose in the UK. Each year about 100,000 people present to emergency departments in the UK with paracetamol poisoning and about half are admitted for antidote therapy with acetylcysteine.¹ Analysis for this atlas shows 53,731 admissions for paracetamol overdose in England in 2014. The trend in deaths involving paracetamol and its compounds has remained relatively stable in recent years (2011-15).² Analysis for this atlas shows 172 deaths mentioning paracetamol in England in 2015.

When taken in its normal dosage paracetamol is a safe and effective painkiller. It can also reduce the temperature of children and adults with fever, and is commonly used for this purpose. Taken in too high a dose, however, paracetamol can be dangerous and can cause fatal liver disease. Metabolites of paracetamol have a toxic effect on the cells of the liver (hepatocytes), which may be caused by as few as 12 tablets of paracetamol. It may take several days, however, before symptoms develop. Although the management of early paracetamol poisoning should be straightforward, the management of late-presenting cases, cases presenting after a staggered overdose and people with risk factors for enhanced toxicity from paracetamol poisoning can be much more complex.

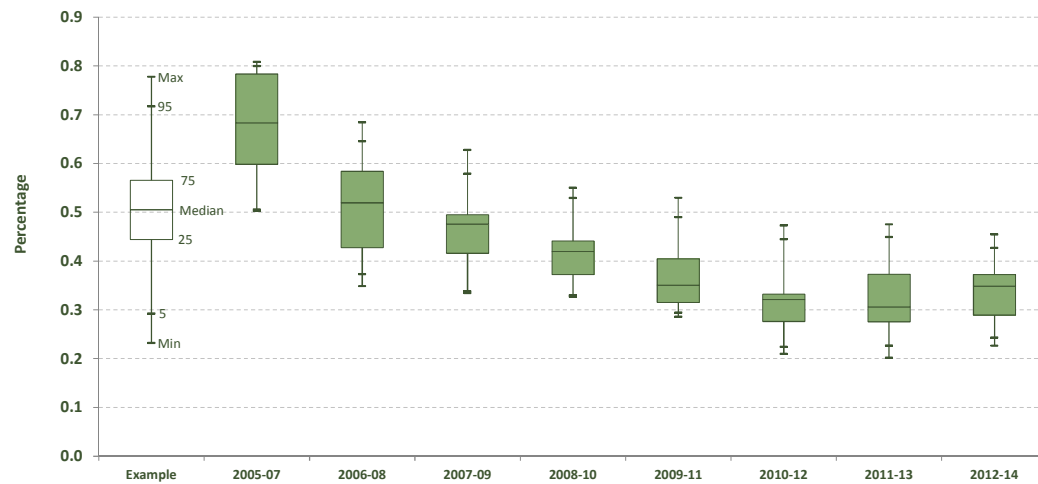
Owing to the widespread availability of paracetamol it is a commonly used means of attempting suicide or deliberate self-harm. In addition, a lack of awareness of

¹ Park KB, Dear JW, Antoine DJ. Paracetamol (acetaminophen) poisoning. Systematic review 2101. BMJ Clinical Evidence. 2015 October. <http://clinicalevidence.bmj.com/x/systematic-review/2101/overview.html>

² Office for National Statistics. Deaths related to drug poisoning in England and Wales: 2015 registrations. Release date: 9 September 2016.

www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsrelatedtodrugpoisoninginenglandandwales/2015registrations

Variation in percentage of deaths from paracetamol poisoning per hospital admissions for paracetamol overdose by region (2012-2014)



Max-Min (Range)	0.31	0.34	0.29	0.22	0.24	0.26	0.27	0.23	No significant change
95th-5th percentile	0.29	0.27	0.24	0.20	0.20	0.22	0.22	0.18	NARROWING Significant
75th-25th percentile	0.19	0.16	0.08	0.07	0.09	0.06	0.10	0.08	No significant change
Median	0.68	0.52	0.48	0.42	0.35	0.32	0.31	0.35	DECREASING Significant

the potential dangers of exceeding the recommended dose means that accidental poisoning is also an important cause of death from paracetamol. Initial symptoms after taking more than the recommended dosage are often no more than mild nausea and vomiting. As liver damage develops over the following days, right-sided abdominal pain may be experienced. If no treatment is given to halt or reverse the liver failure, a build-up of toxins in the body can lead to confusion, jaundice, an inability to clot blood, swelling of the brain and subsequent death.³ As paracetamol alone does not immediately cause drowsiness or unconsciousness, and there is a delay in developing serious symptoms, both factors reduce the likelihood of a person seeking help at an early stage.

Establishing a diagnosis of paracetamol poisoning as early as possible is vital because it is possible to prevent liver damage by administering an antidote. The preferred antidote is acetylcysteine; this protects the liver if infused up to, and possibly beyond, 24 hours of ingesting paracetamol.⁴ It is most effective if given within 8 hours of ingestion, after which effectiveness declines.²

The management of paracetamol overdose requires good and timely referral pathways from primary to secondary care, within secondary care itself from Accident and Emergency to Acute Medical Teams and between secondary and tertiary care pathways. In this context 1 in 500 cases of paracetamol overdose results in liver failure, and potentially 1 in 300 is referred for a liver opinion.

³ BMJ Best Practice: Paracetamol Overdose (Updated March 2017). <http://bestpractice.bmj.com/best-practice/monograph/337/diagnosis/step-by-step.html>

⁴ NICE Evidence Services BNF. Emergency treatment of poisoning. Paracetamol. <https://bnf.nice.org.uk/treatment-summary/emergency-treatment-of-poisoning.html>

Evidence-based treatment pathways can improve the chances of early and effective therapy and successful recovery from overdose. These are available to guide clinicians through the investigation and treatment of all patients presenting to hospital after a paracetamol overdose, which although common is sometimes difficult to manage.

To limit the number of people who take an overdose of paracetamol as a means of attempting suicide or deliberate self-harm, in 1998 the Medicines Control Agency restricted the quantity of paracetamol that could be bought in one purchase. Hawton et al found that, when compared with the pre-legislation data, following the introduction of the legislation there was an estimated average reduction of 17 deaths per quarter involving paracetamol alone (with or without alcohol) that received suicide or undetermined verdicts in England and Wales.⁵ This decrease represents a 43% reduction or an estimated 765 fewer deaths over 11 years from October 1998 to end 2009, and 990 fewer deaths when accidental poisoning verdicts were included.⁵ This decrease was largely unaltered when the analysis was adjusted for underlying trends in poisoning deaths.⁵

Magnitude of variation

Map 19a: Hospital admissions where the primary diagnosis is paracetamol overdose

The maps and column chart display the data for the period 2013/14 to 2014/15, during which CCG values ranged from 30.7 to 304.9 admissions for paracetamol poisoning per 100,000 population, which is a 9.9-fold difference between CCGs. The England value for 2013/14 to 2014/15 was 118.4 per 100,000 population. The boxplot shows the distribution of CCG values for the period 2005/06-2006/07 to 2013/14-2014/15. Both the maximum to minimum range and the 75th to 25th percentile gap widened significantly. The median increased significantly from 81.3 per 100,000 population in 2005/06-2006/07 to 100.7 per 100,000 population in 2013/14-2014/15.

The statistically significant increase in numbers of admissions over this time period contrasts with the reported stable number of deaths over a similar time period. However, it mirrors reported increases in the numbers of young people who self-harm.⁶

Map 19b: Deaths from paracetamol poisoning per hospital admissions for paracetamol overdose

In these maps and charts the numerator for this indicator is death registrations from paracetamol overdose from ONS by region and the denominator is the number of hospital admissions for paracetamol overdose by region derived from HES data.

The maps and column chart display the data for 2012-14, during which region values ranged from 0.23% to 0.45%, which is a 2.0-fold difference between regions. The England value for 2012-14 was 0.34%.

Although there are geographical differences in age-standardised admission rates for paracetamol poisoning, these mortality rates have been calculated using hospital admissions for paracetamol overdose as the denominator. As a result the degree of variation observed in mortality is more likely to be a reflection of the degree of variation in the speed of response and in treatment pathways between primary and secondary care. In cases of overdose it is vital to secure rapid assessment and immediate treatment.

The boxplot shows the distribution of region values for the period 2005-07 to 2012-14. The 95th to 5th percentile gap narrowed significantly. The median of the region values decreased significantly from 0.68% in 2005-07 to 0.35% in 2012-14. Which means fewer people admitted for paracetamol poisoning died, despite the number of admissions rising significantly over this time period.

⁵ Hawton K, Bergen H, Simkin SS et al. Long term effect of reduced pack sizes of paracetamol on poisoning deaths and liver transplant activity in England and Wales: interrupted time series analyses. *BMJ* 2013;346:f1403 doi: 10.1136/bmj.1403 (Published 7 February 2013) www.bmj.com/content/bmj/346/bmj.f403.full.pdf

⁶ Morey, Y., Mellon, D., Dailami, N., Verne, J. and Tapp, A. (2016) Adolescent self-harm in the community: An update on prevalence using a self-report survey of adolescents aged 13 to 18 in England. *Journal of Public Health*, 39 (1). pp. 58-64. <http://dx.doi.org/10.1093/pubmed/fdw010>

Whether this is because health services are reacting in a more timely and effective way or whether the nature of paracetamol poisoning admissions has changed cannot be elucidated from this study. For example, this might have occurred through the changes introduced in 2012 of the thresholds for intervention with acetylcysteine, or perhaps because of the restrictions on pack size and number of packs which can be bought on one occasion.

When interpreting the magnitude of variation it is important to note that some people may have died from paracetamol poisoning before it was possible for any treatment to have been given in hospital.

There is also an issue that there is very significant geographical variation in the use by Coroners of 'narrative' verdicts. This means that in some parts of the country there may be an under-reporting of paracetamol poisoning deaths as a result of suicide or self-harm⁷. This does not affect the number of reported paracetamol deaths but may affect the prevention strategies adopted in local areas.

Options for action

To appropriately reduce non-elective admissions to hospital where the diagnosis includes a paracetamol poisoning and to reduce deaths from paracetamol poisoning, commissioners, clinicians and various services need to work together to review:

- local rates of hospital admission for paracetamol overdose
- whether there are particular age-groups in whom, and areas where, the problem is greatest
- prevention measures within mental health services, schools and the community
- barriers to accessing therapies including crisis care services
- training, especially primary care professionals, to recognise and support people in or approaching suicidal crisis
- provision of population based education on the specific risk of paracetamol overdose
- use of evidence-based flowcharts in the treatment of paracetamol overdose (see 'Resources') are used by all service providers
- the speed of response and pathway of treatment and care in local services for people taking a paracetamol overdose
- audits of the management of incidents that are near fatal

- the consequences of paracetamol overdose on more specialised services and ensure that guidelines and treatment pathways are followed

RESOURCES

- Prescott K, Stratton R, Freyer A et al. Detailed analyses of self-poisoning episodes presenting to a large regional teaching hospital in the UK. *Br J Clin Pharmacol* 2009 Aug; 68(2): 260–268. doi: 10.1111/j.1365-2125.2009.03458.x
- Medicines and Healthcare products Regulatory Agency. Treating paracetamol overdose with acetylcysteine: new guidance. Published 25 September 2012. www.gov.uk/drug-safety-update/treating-paracetamol-overdose-with-intravenous-acetylcysteine-new-guidance
- National Poisons Information Service (NPIS). www.npis.org/
- TOXBASE, the primary clinical toxicology database of the National Poisons Information Service (for health professionals only). www.toxbase.org/
- Office for National Statistics. Deaths related to drug poisoning in England and Wales: 2015 registrations. Release date: 9 September 2016. www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsrelatedtodrugpoisoninginenglandandwales/2015registrations
- BMJ Best Practice: Paracetamol Overdose (Updated March 2017). <http://bestpractice.bmj.com/best-practice/monograph/337/treatment/step-by-step.html>

⁷ Gunnell D, Bennewith O, Simkin S, Cooper J, Klineberg E, Rodway C, et al. Time trends in coroners' use of different verdicts for possible suicides and their impact on officially reported incidence of suicide in England: 1990–2005. *Psychological Medicine*. 2013; 43: 1415–1422. doi:10.1017/S0033291712002401