

AKA: *Laughing Gas, Whippets, Balloons, NOS, "hippy crack" (readers of right wing tabloids), N₂O*

Form and Products: Nitrous Oxide is a non-flammable gas. It has a several legitimate uses including:

Medical Grade: used in medicine as an anaesthetic;

Food Grade: used as a propellant for example in whipped cream dispensers;

Automotive grade: used to increase engine power output (and may also contain sulphur dioxide)

Due to packaging and routes of use Nitrous Oxide may be confused with other gases in cylinders including CO₂ cylinders and cartridges used in soda makers and tyre refills or helium, which is also discharged in to balloons. (*Helium isn't generally inhaled in to lungs – just held in the mouth and so isn't being used as an intoxicant.*)

Medical Cylinders are sometimes stolen from ambulances or hospitals. A key risk of such cylinders is that they contain a large volume of gas and may end up being connected to a face-mask. Such use, without adequate access to oxygen can result in hypoxia and fatalities

Automotive cylinders are the least "clean" form of nitrous oxide. The added sulphur dioxide in the cylinder is to deter inhalation and can cause respiratory irritation.

Food grade and recreational products:

Early on, the easiest way to access Nitrous Oxide was in foodstuffs that contained it such as whipped cream. The amount of gas was very low and so this was a low risk route.



As gas use increased, the main product switched to small steel "whippets" or gas chargers. These tended to be 8g cannisters and were intended to be used with a dispenser. In recreational use a balloon is placed over the nozzle and gas discharged into it for use or sale. One whippet would easily fill three balloons. In the mid 2000s in North East London the going rate was 3 balloons for £5 in the summer parks.



The other way to discharge balloons was using a "cracker." Usually a small metal cylinder, the whippet was placed inside, and a balloon placed over the end. The closing of the cracker would depress the valve. However the increased risk of these was they allowed people to discharge gas straight in to the mouth.



Example costs:

480 chargers (8g/charger) £140

cost per gramme: 3p

enough for 1400 balloons @ £2/balloon = £2500+



Websites shifted to selling larger cylinders. Easigas and Fastgas cylinders containing 580g-640g became more widespread and instead of empty whippets littering the streets it was whole cannisters. Weight-wise large cylinders are more weight efficient than smaller chargers and

so cost less to ship.

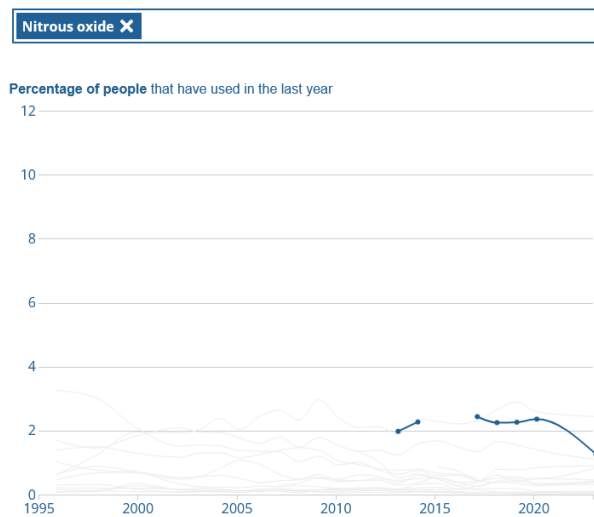
They were typically supplied with a plastic discharge piece over which a balloon should be placed. However again they increased the risk of gas being sprayed straight in to the throat and also of very heavy use in binges.

Finally, super-size cylinders appeared on the market including flavoured and branded products.



Trends: Use of Nitrous Oxide has been poorly monitored in the UK; the Crime Survey of England and Wales primarily looks at Controlled Drugs. It included Nitrous Oxide from April 2012, dropped it in April 2013 and 2014 and picked it up again in 2016.

The data recorded that in 2016-17 9% of 16-24 year olds reported use in the last year. (This was AFTER the PSA had come in to force.) The figure stayed level for the next three years suggesting that the PSA had little impact on use. It then dropped to 4.2% in the year April 2022/March 2023. This was independent of any legal changes, not associated with any significant awareness-raising campaign and so it is not clear what this drop could be attributed to. It may have been linked to growing awareness online of the neural damage associated with heavy use.



Source: Crime Survey for England and Wales from the Office for National Statistics

Amongst 11-15 year olds there is some difference in levels of use amongst girls and boys with reported use ever amongst girls higher in 2016 and 2017. In 2021 levels of use drop in both drop but the reported use amongst girls finishes lower than amongst boys.

	2016	2018	2021
Boys	5.5	5.6	3.2
Girls	6.5	5.9	2.8

Appearance: Gas; most easily identified through discarded cylinders and balloons

Cost: This will depend on volume purchased and if it's being bought from someone selling balloons on the street or someone purchasing directly from a wholesaler. It generally works out at 4p/g and will be cheaper bought direct. So a 2kg cylinder can be bought for £80 – 4p/g. 24 8g chargers are around £8 – 192g for £8.

Quality: Unknown; some of the mass produced imported cylinders claim to be food-grade but this is unknown.

Methods of Use: Inhalation. Generally into a secondary vessel such as a balloon and less commonly via a face mask. Inhalation directly from a cannister brings significant risks.

Detection: Nitrous Oxide is primarily excreted via exhalation and there are not detectable metabolites that would allow for testing for example in urine.

Mechanism of Action: For a relatively simple molecule Nitrous Oxide has a complex mechanism of action which isn't fully understood.

- nitrous oxide may be a chemical that we release naturally to inhibit neuronal processes;
- nitrous oxide may cause release of natural endorphins which act on opioid receptors (i.e. have a weak opiate-like analgesic effect)
- nitrous oxide may act on benzo receptors (anti-anxiety effect)
- it may also inhibit Glutamate receptors blocking pain signals, reducing muscle control and creating dissociation (ketamine-like action).ⁱ

Reasons for Use:

Amongst younger people key reasons for use are likely to be experimental/curiosity and then recreational use.

The short duration of effect, low risk, lack of indicators of use and, until recently legality made Nitrous Oxide an appealing, lower risk option than other drugs and less likely to be detected by parents or teachers.

Amongst recreational users, a high level of social acceptability, social aspects of use (sharing balloons), perceived low risk and ready access made it a popular choice across a range of demographics especially in party settings and unlicensed music events.

Nitrous use may have increased during Lockdown as it was a readily available drug online meaning it could be ordered for delivery and could be used alone.

Nitrous Oxide provides may provide a moderate level of euphoria, reduction in anxiety, reduction in physical distress and a sense of detachment so may have some appeal as an escapist drug.

Dose ranges: The amount used can vary massively. Some people may use two or three whippets in an hour and then stop. Heavy use could extend to several large cylinders a day. reports of people using 240 8g chargers or 3 x 600g cylinders a day are not unheard of.

The larger cylinders make it much harder for people to keep track of their use. At least with smaller, 8g whippets a person can see how many they have used whereas with larger cylinders it's hard to guess how much has been used in a session other than cylinder being new or empty. This increases risk of excessive dosing in a single session. Remember that a large 600g cylinder is the same as 75 8g whippets.

Onset and Duration: The gas starts working seconds after inhalation and short-lasting effects lasting 5-10 minutes.

Effects: Giggles, dizziness, loss of balance. Reduction in pain sensitivity. Falls. Mild euphoria. Mild sense of detachment. Low levels of perceptual change.

Dependency: Nitrous oxide is not considered to be significantly physically addictive. However it is a rewarding chemical and may encourage people to redose. Use may be linked to anxiety and so these or other psycho-social factors may need to be addressed.

In animal studies, short-lived alcohol-like withdrawal symptoms have been observed after heavy dosing with nitrous oxide.ⁱⁱ

Fatalities

The ONS reports that Nitrous oxide was the third most mentioned substance on the death certificate after butane and propane, with 56 deaths registered between 2001 and 2020, and 45 of those having been registered since 2010.

Year of death registration	Number of deaths
2019	8
2018	3
2017	6
2016	8
2015	4
2014	3
2013	4
2012	0
2011	1
2010	5

Source: Office for National Statistics

Overdose: There is a risk of fatality usually caused by hypoxia. This is less likely

with low dose whippets. It is more likely where large containers are used, if a mask is used or where a container is left open.

Usually, with balloons, if someone had used enough to cause drowsiness, they would drop the container or balloon, start to breath oxygen and therefore come round.

This can't happen with a mask in place. There have been fatalities where a large container has been left open in a confined space (e.g. a car) and as a result person continued to inhale gas. This is a greater risk with larger cannisters being used with twist valves which don't close automatically.

Harm reduction: always twist shut the valve after each use; don't use in confined spaces, don't use a mask, leave window open.

Other risks:

Falls and Accidents: nitrous oxide can cause loss of balance and coordination leading to falls. It is safer to use it when seated. Use before or while driving or operating is dangerous and has been implicated in fatal road accidents. Nitrous oxide is exhaled so in confined spaces (such as cars) levels of gas can build up leading to intoxicating – and possibly dangerous – concentrations.

Asphyxiation: as well as the risks associated with excess inhalation (hypoxia) breathing problems can also be caused by spraying gas directly down the throat. The freezing gas can cause swelling of the windpipe or damage to lungs.

Harm Reduction: don't spray gas straight from dispensers, cylinders or crackers. Always use an intermediate device such as a balloon.

Freeze Burns: as gas cylinders discharge they become very cold. This can cause damage to soft tissue in contact with cylinders including hands or legs where cylinders are held between legs.

Use gloves if holding a cylinder and discharging. Don't allow cylinders to come in to contact with bare skin when discharging.

Vitamin B12 deficiency:

Use of nitrous oxide causes vitamin B12 deficiency. It converts the active form of Vit B12 in to an inactive one, and this B12 deficiency can lead to neural damage by reducing the availability of myelin which forms the protective sheath of nerves. The damage is most common in spinal tissue and can cause a range of issues, from numbness and balance problems to paralysis which may be permanent.ⁱⁱⁱ

Supplementing with B12 during use doesn't appear effective as the supplementary doses are rendered inactive by the Nitrous Oxide so to manage these health issues, support to stop using Nitrous Oxide combined with B12 supplements are essential.

Some research indicates that the neurotoxic effects of Nitrous Oxide use are more significant amongst users of Asian heritage. It is not clear if this apparent elevated risk relates to higher levels of use, genetic differences or dietary differences.

Implications: when working with gas users always screen for balance issues, shakes, increased dropping things, limb weakness. When training other professionals, especially doctors, remind them of the importance of asking about gas use when

working with young people with any possible neural issues such as balance problems.^{iv}

In education stressing that gas-related damage can occur with relatively low levels of use and documented cases have occurred where people have been using 20 whippets a day over a number of weeks. The risks clearly rise with very heavy gas use so people using large cylinders may be especially at risk.

Legal Status: Nitrous Oxide became a Class C drug in November 2023. In theory this means a maximum of two years for possession and 14 years for supply.

Prior to 2016 Nitrous Oxide would have been regulated by the Medicines Act and Food Standards regulations. So supply for the purpose of inhalation would have fallen under these medicines regulations in the same way applies to Nitrites.

Nitrous Oxide then fell under the Psychoactive Substances Act 2016 making it an offence to supply it where it was known it would be used for the purpose of intoxication or where the supplier was reckless that it could be thus used.

Websites supplying could reduce exposure to this legislation by asking the purpose of use. While the PSA made it easier to prosecute people supplying gas with balloons outside a party, it was not effective in regulation the supply of large cylinders under the claim it was for the catering industry. The PSA didn't make personal possession an offence, but did create a power to confiscate. In lieu of other enforcement powers some local authorities used Public Space Protection Order powers (PSPO) to regulate possession or supply of Nitrous Oxide

Although the Advisory Council on the Misuse of Drugs recommended against making Nitrous Oxide a Controlled Drugs the Home Office proceeded to do so.^v

The Home Office made changes to the Misuse of Drugs Regulations as follows:^{vi}

Possession: "any person may possess nitrous oxide except where the person—

- (a) intends to wrongfully inhale it; or
- (b) intends to supply it to another person for its wrongful inhalation by any person.

In guidance to accompany the legislative changes "If in possession of nitrous oxide, it will be for individuals to demonstrate that they possess the drug for legitimate purposes."

This is an unusual legal construction as the guidance suggests a reverse burden of proof. If a case goes to court it is up to the Prosecution to establish beyond reasonable doubt that the person intended to inhale the gas, not for the defendant to demonstrate that the possession was legitimate.

Supply: any person may—

- (a) supply, including by way of administration, nitrous oxide,

except where the person knows, or is reckless as to whether, it is likely to be wrongfully inhaled by a person; or

(b) offer to supply nitrous oxide, except where the person knows, or is reckless as to whether, if the substance were supplied in accordance with the offer, it would be likely to be wrongfully inhaled by any person.

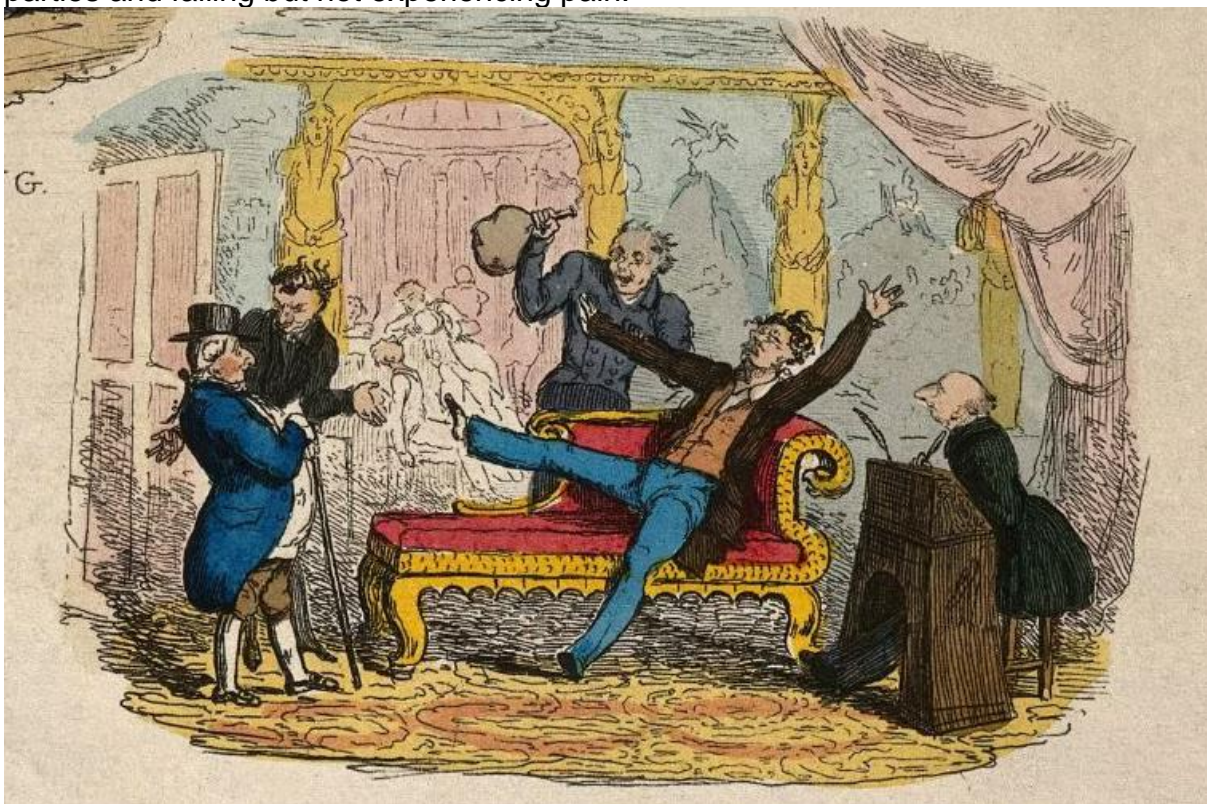
This is unusual as generally with Controlled Drugs there is an absolute binary “you are allowed to supply this” or “you are prohibited from supplying this.” And the Government’s approach – eliding the “reckless” aspects of the PSA with the Class C status of the MoDA creates a new legal grey area.

Such an approach is not easy to enforce and introduces a confusing evidentiary burden as it is hard to prove, for example that an online retailer is being “reckless.”

Back-story and Sources: Nitrous Oxide was identified and recorded by Joseph Priestly in 1772 and use for psychotropic effect documented by Humphry Davy in 1800.

From the late 1700s onwards Nitrous Oxide was used for recreational purposes. In 1844 it’s use as an anaesthetic was recognised by a dentist, Horace Wells.

Apocryphally this feature of Nitrous Oxide was inspired by seeing people using it at parties and falling but not experiencing pain.



Since then Nitrous Oxide has continued to be used in medicine, was explored for use in psychiatric settings, and has been used recreationally.^{vii}

In the 1980s and 1990s while something of a feature of the US drug scene Nitrous

didn't really feature significantly in the UK. Aside from people who had ready access to it in medical settings, use wasn't widespread.

The use of Nitrous Oxide to "top up" on other recreational drugs such as MDMA was being noted in the media in the early 90s in the US^{viii} and

Nitrous use slowly increased in the early 2000s. Nitrous Oxide started to become a feature in a lot of bars in the Mediterranean where balloons of nitrous would be given away with shots or sold in bars and clubs.

In the mid 2000s the upsurge of Novel Psychoactives, sometimes referred to as "*legal highs*" drove an expansion of high street "head shops" and online retailers selling unregulated drugs and this helped drive an increase in Nitrous Availability and use.

While many novel psychoactives were brought under the Misuse of Drugs Act the rest were more loosely regulated under the Psychoactive Substances Act 2016. The looser regulation that this afforded meant that possession of Nitrous Oxide was not illegal and supply was only an offence if it was known (or the retailer was reckless) that the product would be used for intoxication.

So while other emergent drugs vanished from the scene, sales and use of Nitrous Oxide expanded massively with a significant number of online retailers selling it directly or via platforms such as e-bay or Amazon.

Direct sales also continued to take place "under the counter" from shops and onward distribution from people buying large cylinders and then selling balloons on to end users in street, club and party settings.

The impact of the move from the Psychoactive Substance Act to the Misuse of Drugs Act has yet to be fully measured. Online retailers appear to still be trading, using the argument that it remains legitimate to supply for authorised uses.

It seems likely however that overall availability and use will decline as personal possession becomes a criminal offence and supply is reduced.



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Kevin Flemen/KFx: this version 12/23

ⁱ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1821130/>

ⁱⁱ <https://pubmed.ncbi.nlm.nih.gov/7195294/>

ⁱⁱⁱ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7366039/>

^{iv}

https://assets.publishing.service.gov.uk/media/6405b9db8fa8f527f110a3b2/ACMD_Nitrous_Oxide_Report_06_March.pdf

^v <https://homeofficemedia.blog.gov.uk/2023/10/18/media-fact-sheet-nitrous-oxide-ban/>

^{vi} any person may possess nitrous oxide except where the person—

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^{vii} <https://pubmed.ncbi.nlm.nih.gov/30829177/>

^{viii} <https://www.latimes.com/archives/la-xpm-1992-03-07-mn-3542-story.html>