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NEW ZEALAND LISTENER

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DREAD *of* LEAD

- 'Stunning' new links between crime & lead levels
- Even small amounts harm IQ & affect behaviour



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THE DREADED LEAD

“Stunning” links have been found between crime rates and levels of lead in the body, and the poison long banned from paint and petrol is still “a massive problem”. **by CATHERINE WOULFE**

Lead makes great paint. Hard, glossy, durable, washable; the colours stay true and a little goes a long way. Until the 1980s, New Zealand’s DIY army happily slapped it on every available surface. Some of us – shh – still have a few leftover tins stashed in the shed. Lead also works well in petrol. It acts as a sort of chemical cushion, helping to prevent exhaust-valve wear and tear. Leaded petrol was the norm here until the 80s, too.

But in the human body, lead does profound damage. And a growing pile of international research suggests our exposure to lead – mainly from paint and petrol – is a major driver of changes in the crime rate. In the US, economic consultant Rick Nevin has tracked blood lead levels and crime trends for seven countries and says the correlations are “stunning ... stupefying”. The correlations in New Zealand are among the strongest he’s found: here, he says, lead explains 93% of the variation in the crime rate over three decades.

The World Health Organisation (WHO) ranks lead among 10 chemicals of major public health concern. It estimates that every year, lead causes 143,000 deaths worldwide and contributes to the intellectual disabilities of 600,000 children.

“At high levels of exposure, lead damages the brain and central nervous system to cause coma, convulsions

and even death,” WHO documents explain. “Children who survive such poisoning are often left with intellectual impairment and behavioural disorders.”

In New Zealand, a couple of hundred cases of lead poisoning are reported every year, most of them adults exposed to lead at work, through renovations or from hobbies such as shooting and leadlighting. Many cases are thought to go undetected.

And we have no idea how many of us fall into a second category – low exposure to lead over time – that



GETTY IMAGES



YOU CAN'T SEE OR SMELL IT

Here's how it works: thanks to the glory years of lead paint and petrol, fine particles of lead have accumulated in soil and house dust. You can't see or smell the particles. But they're there, blowing in the wind, sticking to leafy greens in our vege gardens, getting tracked inside by pets and people. As journalist Kevin Drum wrote in a compelling *Mother Jones* piece last January, banning lead paint and petrol was a necessary first step. But now "the zombie lead is back to haunt us".

The really alarming side of this is that young children crawling around on contaminated surfaces and shoving sticky fingers in mouths can ingest enough lead to do permanent damage. Give those sticky-fingered, lead-damaged children 18 or 20 years and they hit the "peak age" for various sorts of crime: burglary, robbery, violent and sexual assault, murder.

Nevin's graphs allow for these lags, comparing the level of blood lead of each cohort of children with the rate of crime happening in their area when they hit "peak age".

In the US, he found lead exposure explains 90% of the change in the crime rate. The pattern holds for each individual type of crime he's looked at, and perhaps most tellingly, it holds even as crime rates drop off a cliff – a couple of decades after leaded petrol began to be replaced by unleaded.

Nevin has found similar patterns in all the places he's looked at: Australia, Canada, the UK, France, West Germany and New Zealand. Using 33 years of crime data, he found that changes in blood lead levels in New Zealand preschoolers explain 93% of the variation in our overall crime rate.

"That was one of the highest," Nevin says. "Britain was even higher at 95%, Canada

the WHO warns can also have devastating effects.

"At lower levels of exposure, which cause no obvious symptoms and that previously were considered safe, lead is now known to produce a spectrum of injury across multiple body systems. In particular, lead affects brain development in children, resulting in reduced IQ, behavioural changes, such as shortening of attention span and increased antisocial behaviour, and reduced educational attainment.

"These effects are believed to be irreversible. Adults are at increased risk of kidney

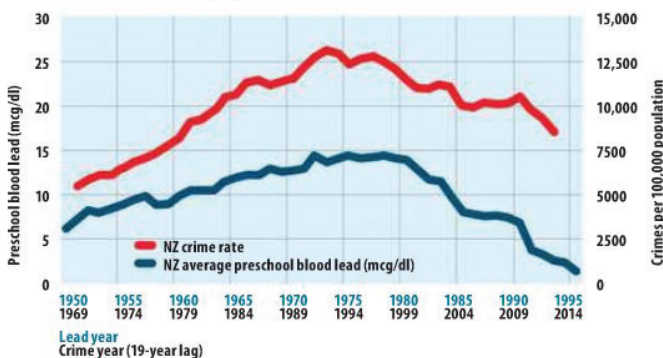
disease and raised blood pressure."

Among the hundreds of studies the WHO cites in its case against lead is Nevin's 2007 research showing the correlations with crime. Nevin is a senior economist for technology, policy and management consultants ICF International. Along with much of Nevin's other work on lead, the 2007 paper was published in the prestigious journal *Environmental Research*. It's heavy going, but it's the simple line graphs that get you. Those two lines – lead and crime – stick together over time with extraordinary tenacity.

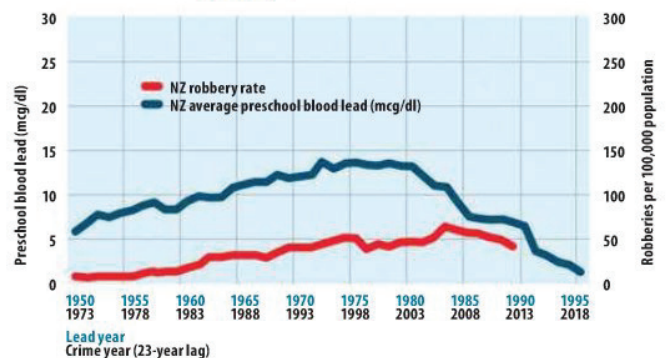
SOURCE: RICK NEVIN

THE LINK BETWEEN NEW ZEALAND LEAD LEVELS AND CRIME RATES

1. Lead levels & crime rate



2. Lead levels & robbery rate



“It sounds like a bad science fiction plot, that an entire planet could systematically poison their children.”

was about 90%, the US was only 80%.”

Drilling down into different categories of crime in New Zealand, he found blood lead explained 91% of the variation in robbery rates, 86% for burglary, 79% for violent and sexual crimes, and 60% of changes in the murder rate. (Murder rate correlations were weakest in all the countries Nevin studied; he thinks this is because murder may be more linked with the sort of neurological damage caused by severe lead poisoning, rather than the lower-level ongoing exposure he had data for.)

Sceptical? So was Nevin at first. “Frankly, I was a little bit reticent when I reported that in my first study ... I assume there are other things that affect crime, but every year more and more evidence comes in that suggests the impact of childhood lead exposure is so incredibly strong that it tends to just block out the impact of anything else.”

He believes the effect of lead goes a long way to explaining higher crime rates in cities, which tend to have higher lead concentrations. He believes lead even underpins racial profiling, pointing out that in America, black children were more likely than others to grow up in cities or in dilapidated housing and were therefore exposed to more lead.

Nevin says the many studies that link



crime rates with other factors, such as access to legal abortions, the population mix and unemployment – but leave out lead – will have “some odd results”.

But as unemployment is so widely understood to drive crime rates, he crunched the numbers for that and found in most cases the effect it had was relatively tiny. For example, he found unemployment in the UK explained 1.3% of change in the crime rate.

“The commonly held belief that crime is driven by bad economic times just isn’t borne out by the data, and in the New

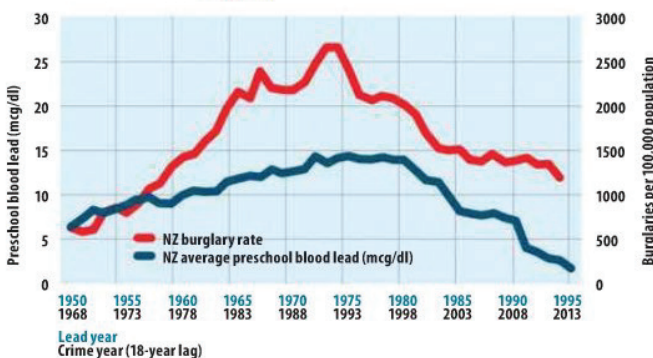
Zealand [results], where you don’t even see it show up, the reason is it wasn’t even statistically significant. To my knowledge, there is nothing else that has come close to accurately forecasting crime rate trends over this length of time in so many different places.”

BUT IS LEAD ACTUALLY THE CAUSE?

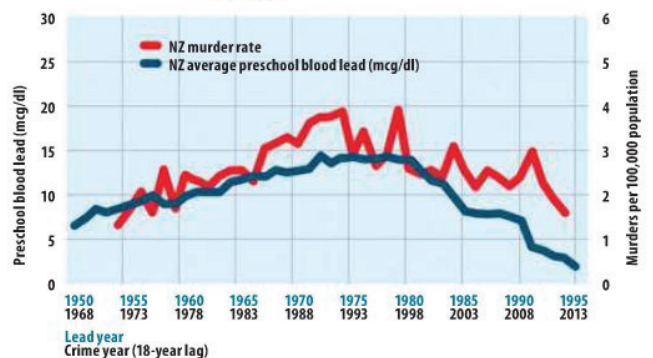
Unsurprisingly, Nevin hears the “correlation is not causation” argument all the time.

His answer? “All the evidence of causation that you look for in public health research is clearly and overwhelmingly evident

3. Lead levels & burglary rate



4. Lead levels & murder rate



How to test your home

Concerned about lead levels at your place? Experts advise testing not just the paint but the soil around the house as well as the dust inside it. This is particularly important if young children live at the home or visit often.

Cheap lead-testing kits are available at hardware stores, but these are generally geared to work only on paint.

The *Listener* found one such kit whose packaging says it's useful for dust testing. But in environmental scientist Ben Keet's opinion, it's not. Keet, who specialises in detecting chemicals in living environments, notes that the company website says the kit will pick up lead down to 600 parts per million. But that's twice the "action level" set down by the United States Environmental Protection Agency. Therefore, says Keet, "I wouldn't recommend the kit for dust".

These kits are useful when used on paint, however, because lead-based paint contains lead in the thousands of parts per million. It's definitely wise to use the kits before launching gung-ho into renovations. You'll probably need a new kit for each paint surface.

Nick Kim, a senior lecturer in health and life sciences at Massey University, recommends that anyone concerned about lead in dust or in garden soil forget the retail kits. Instead, he urges them to contact a commercial analytical laboratory. It will probably send out containers and instructions and ask for small samples of soil or vacuum cleaner dust. Their analysis can give precise lead levels for about \$40 to \$80.



between lead exposure and crime trends."

In this case, causation can't be established by randomised trials: that would mean feeding a few thousand toddlers lead to see whether they grow into criminals.

In such situations, academics trying to cement a causative link instead turn to three core principles.

The first is that the link must be theoretically plausible. Done, says Nevin. "We have this massive amount of biological research, including MRI studies, and many other perspectives that detail all the negative neurodevelopmental effects of childhood lead exposure."

The other two indicators are the strength of the correlations and their consistency. Nevin believes he's got those covered, too. In his own work, he's found similar correlations between lead exposure and educational attainment, teenage abortion and mental retardation.

And he's not the only researcher to have found links between lead and crime.

In 2007, Massachusetts public health policy professor Jessica Reyes published research examining lead emissions at the state level. She found that emissions varied widely from state to state – and, accordingly, so did the crime trends.

Research in 2012 by Tulane University academics Howard Mielke and Sammy Zahran zooms in even closer, to the city level, and again finds the same correlations holding from city to city. Mielke told *Mother Jones* he had tracked lead at the neighbourhood level in New Orleans and showed the maps to local police. "When they overlap them with crime maps, they realise they match up."

Last year, similar research by Professor Mark Taylor at Sydney's Macquarie University caused a flurry of media attention across the ditch. Taylor looked at the peaks in lead air pollution levels and crime rates – by suburb – and found that time after time, the peaks showed "a strong correlation", with roughly a 20-year time lag.

Nevin is relieved that after years of the lead-crime link being treated as a quirky, quasi-explanation, it is finally getting serious attention. His work has now been covered by the *Guardian*, *Forbes*, the *Washington Post* and the *Independent*. At the same time, he knows it still sounds nuts.

"It sounds like a bad science fiction plot, that an entire planet could systematically poison their children, with implications this severe, over such a long period of time. That's hard to fathom by itself. That they



“If people up the street weren’t taking care with removing the paint, your house would get contaminated as well.”

could have done it in two different ways – with paint and then with gasoline – over the span of a little over 100 years, is even more astonishing.”

ARE YOUR KIDS AT RISK?

Brian Gulson, emeritus professor at Macquarie University, is an environmental scientist who has extensively studied lead and the way the particles behave in homes and in the human body. He has followed the research linking lead to crime and says Nevin’s work “looks really good” from an academic perspective.

But what does it mean for us? And how are we to know if lead is a problem in our homes? Official New Zealand recommendations say if your house was built in the 1980s or earlier, it’s best to presume there’s lead paint on it somewhere.

But Gulson says lead knows no borders. His air-expert colleagues estimated that when fine particles of lead paint were disturbed by sanding during work on Sydney bridges, those particles could end up in house dust several kilometres away.

Children are occasionally poisoned by eating flakes of lead paint or mouthing lead-painted toys, which can taste sweet. In 1993, a one-year-old New Zealand child died after chewing through four layers of cot paint, some of which was lead-based. But Gulson says, “The dust is really the important thing”.

And it’s not just the people downwind of bridges or doing up old villas who need to be concerned. “We also showed that even if you weren’t renovating your house, if people up the street were and they weren’t looking after it carefully and taking care with removing the paint, your house would get contaminated as well.”

He recalls one case where a child was found to have worryingly high blood lead levels. The parents spent “a very large sum of money” on the dust clean-up, ripping



up carpets and replacing the soil, only for the property to be re-contaminated within months.

By tracing isotopes, Gulson was able to track the new lead particles back to the source. “About six houses down, some guy had 22%-lead paint and he was just taking it off with an angle grinder.” The house right next door was also contributing – paint chips were peeling off the exterior walls and blowing in through the family’s french doors.

DISASTROUS EFFECTS

Natural disasters are also something of a party time for lead. Gulson worries about dust that accumulates in roof spaces. He’s seen it up to 10cm thick, and says it can still contain particles from leaded petrol, as well as from lead paint.

When a severe hailstorm tore through Sydney in 1999, many roofs were damaged, “the ceilings collapsed and then all this dust got into the houses”. The Brisbane floods also spread lead about. “There were so many old weatherboard houses up there and this was a big issue, too – people essentially pulling them down but not realising the lead paint was there.”

Gulson is particularly concerned about

Christchurch post-earthquake. “My wife and I came over there for a holiday four or five years ago and I was just stunned by the number of weatherboard houses that were around. I thought, ‘Oh my god, this is worse than Sydney.’”

Then there are the areas with industrial smelters, like Broken Hill and Port Pirie, where elevated blood lead levels are more common. Gulson says when Broken Hill children were tested in the early 1990s, more than 80% of the under-fives had blood levels above 10 micrograms per decilitre, which at the time was the “level of concern” according to the American Center for Disease Control and Prevention (CDC).

Thanks to a multimillion-dollar remediation programme, that proportion has since roughly halved. But so has the CDC’s line in the sand: as evidence mounted about the damage lead does at very low levels, the CDC dropped its guideline for blood lead to five. Worse, it is now known that blood lead under that original level of 10 can pull IQ down by as much as seven points.

So families in Broken Hill continue the battle against lead dust: covering their sandpits, washing children’s toys daily and wiping down every surface two or three times a day.

LEAD ASTRAY

Dealing with a common poison

How to minimise the health risks from exposure to lead.

LIFETIME EFFECTS

When lead is ingested or inhaled, it travels to the bloodstream and accumulates in the bones. It is then re-released into the system, meaning a child or adult exposed to too

much lead may be re-exposed long after the original exposure.

EFFECTS ON ADULTS

- Can damage the brain, affect fertility, increase the risk of miscarriage or stillbirth, and raise blood pressure. In pregnant women, lead can cross the placenta and damage the fetus. Also linked to anaemia, seizures, hearing loss, nausea, fatigue.
- Possible symptoms: headaches, irritability, aggressive behaviour, insomnia, abdominal pain, loss of appetite, constipation, anaemia.

SOURCES

- Lead-based paint peeling off or being

unsafely removed from your house or a neighbour's. Previous shoddy renovations.

- Soil and house dust.
- Food (lead particles can coat the skin of vegetables; wash before eating).
- Lead-painted toys or furniture, some Ayurvedic and Chinese herbal medicines.
- Pica: children eating dirt or paint.
- Hobbies: particularly indoor shooting and leadlighting.
- Drinking water from lead pipes.

EFFECTS ON CHILDREN

- Can be permanent and irreversible.
- Low levels are often undetected: no obvious symptoms. Child might be fatigued, irritable, losing weight, pale or weak.

The wide problem, Gulson says, is that "people forget about all the other towns and cities, especially large ones like Sydney and Melbourne, where you've got all this old housing ... I worry about the people in these cities.

"Somehow or other the message needs to get out to people again: look, we worried about lead before, but the issue has not gone away. Just be aware that you might be living in a suburb or a house that potentially has lead paint. If it does, test it, and then be very careful about what happens to it. And keep an eye on your neighbours."

A BLIND EYE

This surely can't bode well for New Zealand, with our weatherboard-heavy housing stock and she'll-be-right DIY attitude. "You've got a massive problem," warns Gulson.

We don't have the statistics to prove it, though. As Philippa Howden-Chapman, a professor of public health at the University of Otago, says, "Apart from removing lead in petrol and stopping the sale of lead paint, New Zealand has largely turned a blind eye to the problem of existing lead paint in housing ... Because there is no nationwide survey of housing in New

Zealand, we have no idea of how large, or small, a problem it is." Howden-Chapman believes it's important we survey lead levels in rental properties.

Rick Nevin agrees. "I wish more children were tested for their blood lead levels, but even more importantly, I wish more homes were tested, because I'd rather not use little children as the testing device. You want to catch it before the blood lead is elevated, and they can do that with dust analysis."

So what do we know about lead in our homes and our kids? Not nearly enough. Some workplaces with a high risk of lead exposure monitor employees' blood lead. But testing of ordinary homes and children happens on an ad hoc basis and usually only if a doctor connects the dots between a sick child and home renovations.

But we do know a little about the lead exposure some New Zealanders endured as children. Gulson admires research by Daphne Hinton, published in 1988, which surveyed the lead levels in the blood and

home environments of 516 South Island families.

Hinton's paper notes the "usual range" for

South Islanders' blood lead at the time. Converted to today's measurements, usual blood lead levels ranged from 12 (in the youngest babies) to about 21 to 23 in preschoolers, schoolchildren and males over 16.

At the time, men dealing with lead in their work would be counselled on hygiene and work habits if their blood lead hit about 103. They would be suspended if it got to about 145.

By today's standards – and the CDC's latest guideline of 5 – that's terrifyingly lax. And the bar just keeps dropping; no safe blood lead level has yet been identified.

Hinton found that even by 1988 standards, which seem so loose in hindsight, almost 60% of the 260 preschoolers tested had slightly or significantly elevated blood lead levels. Further, a third of babies younger than 10 months had slightly elevated levels, and a quarter of schoolchildren had slightly or significantly elevated levels. Most with elevated blood lead reported no symptoms.

The children in the study will now be hitting their thirties and forties. Some may not have been too adversely affected by lead exposure – Nevin says the damage depends on such variables as the precise age of the child, genetics and other biological factors.

"There are very severe public health risks that don't affect everybody. When you have a large population exposed, you don't know what's going to be the effect for any individual, but you can predict with horrifying accuracy what the effects will be across the entire population."

Because individual effects of lead are so uncertain, he doesn't want parents to panic. "On the other hand, I want them to take sensible precautions."



From top, Philippa Howden-Chapman; Rick Nevin and Brian Gulson.

GETTY IMAGES; RICK NEVIN PHOTO; CAROLYN CYRAN

- Can lead to learning disabilities, diminished IQ, behavioural problems, malformed bones, organ damage, hearing problems, slow growth.
- Very high levels can cause seizures, coma, death.

WHAT PARENTS CAN DO

- Take your child to a GP. Ask for a blood test if there is concern about lead exposure. Make sure siblings are tested if high levels are found.



- Frequently wash your child's hands, toys, dummies.
- Test house dust and soil, as well as paint (on furniture and house surfaces).
- Never dry-sand lead paint or acrylic that may have lead paint underneath.
- Paint lead surfaces with acrylic. Discard contaminated carpets. Replace or cover contaminated soil.
- If working with lead, wash clothes separately and shower before cuddling kids.

THE BIG CLEAN-UP

Hawke's Bay environmental scientist Ben Keet specialises in detecting chemicals in living environments. Like Nevin, he believes it's time to turn our attention from researching lead prevalence and its effects to halting its spread and cleaning it up.

"We know it's a problem. We know the cause of the problem, and we know a solution that is not really that costly. Of course, if you multiply it by half a million houses, it becomes more costly, but then again, what is the cost to the nation in a loss of productivity if half a million people have their IQ lowered by 10 points?"

Lead clean-ups can get very complex. Nevin says old windows often create a disproportionate amount of lead in dust, as they have moving parts. His advice: replace them. Carpets contaminated with lead should be thrown out.

Keet says it's also important to replace or cover contaminated soil – with, say, gravel, pavers or a load of fresh topsoil – and to paint over any deteriorating lead paints with acrylic. "Acrylic paint is almost like a cling-wrap film – it clings to everything and will basically seal the lead-based paint behind an acrylic coat."

Keet insists those two actions – covering soil and painting over lead paint – would break the "cycle of poverty" he believes is at work with lead contamination. It goes like this, he says: family lives in dilapidated old house, the lead paint corrodes and turns into dust, the children's brains are damaged, the children end up in less well-paying jobs. Repeat. He would like to see a repaint subsidy like that available for insulation.

"You could buy the paint to fix the house for probably two weeks' rent," he says. "It has a lifelong effect on that house. It costs far less than insulation and probably has more effect on the kids than dampness."

Lead testing is not a condition of the housing Warrant of Fitness scheme being piloted on state houses. Keet, Gulson and Nevin believe it should be.

THE OSTRICH EFFECT

What about public awareness of lead and its dangers? Nevin says, "If people were more aware of the overwhelming evidence linking it to all of these social ills, we would be moving much more aggressively to eliminate the remaining risk."

But Gulson says the prevailing attitude is that we've got rid of lead in petrol, so that's it, problem solved. He often gets asked why he's wasting his time on lead.

Keet believes the problem is a mix of ignorance and people assuming it will cost so much to decontaminate their homes they'd rather not know. "It's the ostrich politics, the

Gulson worries about dust that accumulates in roof spaces, as it can still contain particles from leaded petrol as well as lead paint.

heads in the sand and she'll be right, it can't be that bad, things like that."

He says there are good brochures available in hardware stores and online that warn of the dangers of lead paint and explain how to deal with it safely. "The trouble is those brochures don't get to the people." He would like to see letter-box drops and big posters put up in paint stores, with staff specifically trained to engage with customers buying paint or paint-removal equipment.

But it seems even when we're told of the dangers of lead, many of us prefer not to think about it.

Keet is baffled by his experience at a recent Hawke's Bay Small Block Field Day. He set up a stand in a spot that every one of the thousands of visitors had to walk past. He displayed information about the dangers of lead and offered free, comprehensive, confidential lead testing. He had visions of hundreds upon hundreds of requests. The grand total after four days? Fourteen. He found most of those homes had lead levels above the current "action level"; some had lead up to 10 times that concentration.

But Keet didn't get around to testing his own home until five years after he bought it. And yes, lead paint was everywhere: the previous owner had used it to spruce up the windowsills and frames for sale.

Gulson's guilty, too. In 1992, when he was about to look at lead in teeth from children at Broken Hill, he decided to analyse a tooth his son had knocked out years before while surfing. "We found he had as much lead in his tooth as some of the kids who had really high blood lead in Broken Hill. And then I suddenly realised: 'Oh my god, we live in a house that was built in 1932, and it's full of lead.'"

"I was devastated. Because I did absolutely everything wrong with taking the paint off. I used these bloody propane torches, I used grinders, I used sanders, I didn't worry about cleaning up. I'd wear the same clothes all weekend and I'd pick up my son and cuddle him."

So when people tell Gulson they were practically weaned on lead and turned out just fine, he thinks, well, you never know what might have been. "I always say, 'My son could have won a Nobel Prize, maybe, if I hadn't lead-poisoned him.'"

Rick Nevin's academic papers showing correlations with lead exposure: www.ricknevin.com. Guidelines on how to deal with lead paint when renovating: bit.ly/1bBkQ1C