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Abstract | Three pillars—harm reduction, demand reduction and supply reduction—underpin the harm minimisation framework of Australia's drug policy. Much of the activity undertaken by law enforcement is aimed at reducing the availability of illicit drugs and thereby increasing price and reducing demand. This article presents a contemporary, systematic review of research exploring the price elasticity of demand for illicit drugs. Overall, the results indicate that the demand for illicit drugs is, on average, weakly price inelastic—a 10 percent increase in the price of illicit drugs results in a decrease in demand of approximately nine percent. The degree of elasticity varies by drug type, with the greatest elasticity indicated, albeit on a small number of studies, for amphetamine-type substances. The international differences seen point to a need for more Australian research, ideally with robust experimental methodologies and across a range of drug types.

The price elasticity of demand for illicit drugs: A systematic review

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Australia's National Drug Strategy 2017–2026 is the most recent iteration in a long history of drug policy development, and commits Australia to three pillars of harm minimisation: demand reduction, supply reduction and harm reduction (Department of Health 2017). Although nationally coordinated by the Department of Health, both Commonwealth and state and territory law enforcement agencies play a key role across all three pillars. Annually, law enforcement expenditure accounts for an estimated 66 percent of all spending on drug policy (Shanahan & Ritter 2013), but it is the heavy investment in supply reduction that has received the greatest scrutiny.

Supply reduction encompasses myriad domestic and international activities whose primary goal is to reduce the availability of illicit drugs. On an international scale, there are numerous bilateral and multilateral cooperative agreements through which intelligence gathering and interdiction operations seek to disrupt international trafficking from primary production and secondary source countries. In this context, Australia's geographical position is an advantage, as it does not share a porous border with any of the large production sites in Latin America or South-East Asia.

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Domestically, illicit drug supply reduction activities range from immigration, customs and border control initiatives to local-level policing strategies, each with the objective of reducing street-level supply by dismantling local production capabilities and disrupting internal distribution networks. These law enforcement activities seek not only to lessen the overall availability of illicit drugs (and reduce the opportunities for drug use) but also to manipulate aggregate and individual-level demand for drugs through market mechanisms such as an increase in price. As highlighted by Chalmers, Bradford and Jones (2009), supply side law enforcement is often justified on the assumption that by increasing the risks associated with production, transportation and trade, suppliers will be forced to compensate for these risks by increasing the price of their product or reducing purity. The work of Caulkins and Reuter (1998, 1996) and Reuter and Kleiman (1986) is particularly useful here because they highlight the challenging and sometimes unpredictable dynamics of drug pricing in the context of different law enforcement scenarios.

The extent to which the demand for a product is influenced by its price is known in economics as the price elasticity of demand. The demand for a product is defined as price elastic if the proportional change in quantity demanded is greater than the proportional change in price. For example, if the quantity demanded falls by more than 10 percent in response to a 10 percent price increase, demand would be considered elastic. Conversely, the demand for a product is defined as price inelastic if the proportional change in quantity demanded is smaller than the proportional change in price. For mathematical completeness, unit elasticity is the case where the proportional change in quantity demanded is equal to the proportional change in price. Demand is considered perfectly inelastic if the coefficient of elasticity is 0, perfectly elastic if the coefficient of elasticity is –1, inelastic if the coefficient is between –1 and 0, and elastic if the coefficient is less than –1.

In the context of the price elasticity of demand for illicit drugs, it is important to be clear about what is being estimated. As noted by Saffer and Chaloupka (1999), drug consumption survey data typically have a large number of observations with a value of zero, which causes econometric problems. Because of this, three different drug consumption concepts are commonly defined:

- *participation*—a dichotomous variable indicating whether an individual is or is not using drugs, yielding a concept known as participation elasticity (ie how levels of drug use participation respond to changing prices).
- *use given participation*—a continuous measure of quantity of consumption but only for individuals who participate, yielding the most common measure of price elasticity of demand found in the literature—and the concept of price elasticity of demand that is the focus of this study.
- *use regardless of participation*—a continuous measure of consumption for all individuals within a defined population, regardless of whether or not an individual uses drugs at all. This measure of price elasticity of demand is seldom used as population-wide survey data of drug use is rare and the aforementioned large number of zeros cause estimation problems.

A key to understanding the likely effectiveness of efforts to reduce the supply of illicit drugs is the relative sensitivity and responsiveness of its users to an increase in price. This question is especially important because a number of law enforcement strategies have produced mixed results and in some cases unintended consequences. Mazerolle, Soole and Rombouts (2007) explore the research evidence on a series of market-level policing strategies, including 'crackdowns' (Davis & Lurigio 1996), 'police raids' (Cohen, Gorr & Singh 2003), 'undercover or covert operations' (Williams et al. 2001), 'search and seizure' (Pollack & Reuter 2014) and 'high intensity policing' activities (Piza 2018). In each case, the evidence was insufficient to establish an association between the strategy and a subsequent reduction in the size of local drug markets.

The evidence on unintended consequences is much stronger. For example, research has shown that many of the aforementioned supply reduction strategies risk temporal and geographical displacement (moving crime to other times or places), negative impacts on local patterns of drug use and purchase, an increase in unsafe injecting practices and a decrease in the demand for treatment (Aitken et al. 2002; Kerr, Small & Wood 2005; Volkmann et al. 2011; Wood et al. 2004).

To inform policymakers about the responsiveness of drug demand to an increase in price, this study conducts a systematic review of research on the price elasticity of demand for illicit drugs. Market adjustments can manifest as changes in the purity of drugs at a given price (Caulkins 2007). Therefore, price elasticity of demand should be interpreted alongside purity analysis. Ideally, a purity-adjusted price should be used when estimating elasticity of demand. However, purity-adjusted prices can be difficult to obtain, so researchers employ a range of strategies to control for the purity of drugs in their estimation of demand. These strategies are discussed in more detail below.

Method and data

This systematic review consolidates contemporary economic, drug policy and criminal justice literature in an attempt to quantify how demand for drugs responds to changes in drug price. There have been two systematic reviews previously conducted on the price elasticity of demand for illicit drugs: Gallet (2014) and Pacula and Lundberg (2014).

Gallet (2014) examines 42 studies which together made 462 separate observations. The author highlights that a number of characteristics influence the estimate of elasticity, including drug type, whether demand is modelled in the short- or long-run, the unit of measurement for quantity and price, whether alcohol and other illicit drugs are included in the specification of demand, and location. Characteristics that have little influence on price elasticity of demand include include the functional form of the demand equation (ie whether the relationship between price and quantity demanded is linear or logarithmic), the type of data and method used to estimate demand, and the quality of the publication.

Focusing solely on marijuana use, Pacula and Lundberg (2014) assess how consumption changes in response to changes to price and enforcement risk, explicitly considering how this responsiveness varies among different user groups. The authors conclude that it is clear that the demand for marijuana is responsive to changes in both its monetary price and the non-pecuniary aspects of price, particularly those pertaining to legal risk. However, the responsiveness of demand depends on the type of change (price change versus criminal status change) and the type of user (light, casual, regular or heavy). With regard to changes in price, the authors report that for every 10 percent decline in price, there will be an increase of three to five percent in the number of new marijuana users aged under 18, an increase of 2.5 percent in the number of regular users, and an increase in the duration of marijuana use during adulthood.

Search strategy and study selection

Methodologically we opted to update these existing reviews with additional research material published between 2010 and June 2019. To systematise this, we searched for keywords across six separate databases: Scopus, Web of Science, Criminal Justice Abstracts, PsycInfo, EconLit and Google Scholar. We were interested in four types of illicit drugs, including marijuana/cannabis, cocaine, heroin and methamphetamine. Thus, our search terms were as follows:

drug OR marijuana OR cannabis OR cocaine OR heroin OR methamphetamine OR amphetamine*

AND price OR demand OR elasticity

AND NOT medic AND NOT pharma**

We limited our search to peer-reviewed journal articles published in English. This initial search yielded 1,157 studies. After title screening, a sub-sample of 474 studies were retained as being relevant to illicit drugs and illicit drug markets. Of these 474 studies, 14 studies not reviewed by either Gallet (2014) or Pacula and Lundberg (2014) included specific analysis of price elasticities, and 12 of these studies estimated the price elasticity of demand for illicit drugs. A PRISMA diagram illustrating the search process is provided in the *Appendix* (Figure A1).

The illegal nature of illicit drugs makes studying the price elasticity of demand difficult; as such, most studies rely on survey data or data gathered via behavioural economic experiments. In surveys, respondents typically self-report their level of use over the last 12 months or 30 days. Consumption is treated as a binary variable, coded '1' if the individual uses a drug and '0' otherwise. These studies examine the impact of price on the decision to use drugs and report participation elasticity rather than the price elasticity of demand.

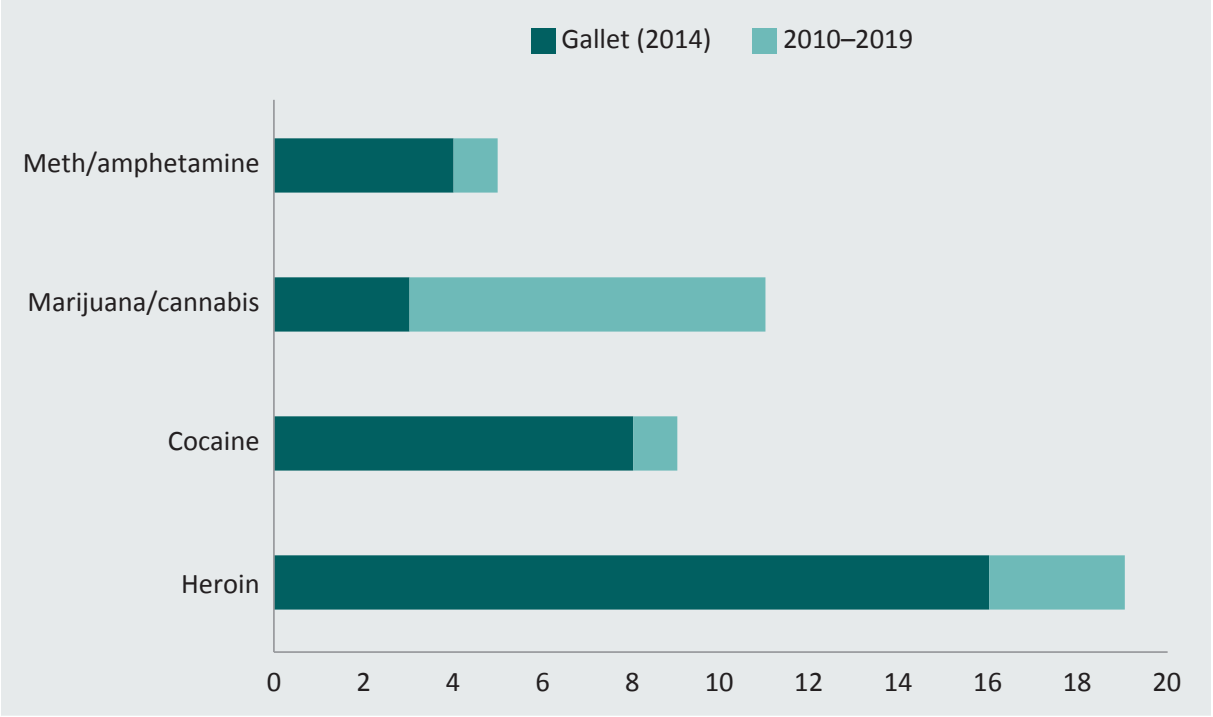
With experimental data, drug users respond to a series of hypothetical price changes, indicating whether or not they would use and, if they decided to use, how much they would use. From this data the impact of a (hypothetical) change in price on quantity consumed (ie price elasticity of demand) can be estimated (see, for example, Aston et al. 2016; Collins et al. 2014; and Olmstead et al. 2015). A further source of data from which price elasticity of demand can be estimated is crowdsourced data on actual transactions, including data on price, quantity traded and possibly quality (see, for example, Davis, Geisler & Nichols 2016). These data, however, are subjective and based on unqualified user reports. They are therefore not suitable for estimating price elasticity of demand.

As noted above, we focus solely on price elasticity of demand, treating consumption as a continuous scale. The argument for not including participation elasticity is that this measure does not take into account the price responsiveness of regular or heavy users, who, according to data from the 2001 National Household Survey on Drug Abuse, account for 71 percent of total drug purchases (Caulkins & Pacula 2006). We identified 35 studies (23 identified by Gallet (2014) and 12 more recent studies) that estimate price elasticity of demand (Table 1). Several studies report multiple estimates of price elasticity, depending on empirical specification. In Table 1 we report the median estimate from each study for each drug type. This approach is consistent with that of Gallet (2014). The advantage of using the median (as opposed to the mean) is that the median is less affected by outliers and a skewed distribution, particularly when the number of elasticity estimates in each study is small. Unlike Gallet (2014), we exclude elasticity estimates for suppliers from the median calculation because suppliers are not representative of drug users.

Results

Figures 1 and 2 present the number of studies classified by drug type and location. As shown in Figure 1, a large number of studies focus on the price elasticity of demand for heroin. More recent research effort has been devoted to estimating the responsiveness of marijuana consumption to changes in price. Although no studies focus exclusively on methamphetamine, five of the nine studies that estimate price elasticity of demand for a number of drugs include methamphetamine or amphetamine-type substances. As shown in Figure 2, the majority of studies were conducted in the United States, Norway and Australia, with one recent study conducted in South Africa.

Figure 1: Price elasticity of demand studies, by type of drugs (*n*)



Note: Some studies examine multiple drug types; therefore the categories are not mutually exclusive and the total number of studies in this figure exceeds 35

Figure 2: Price elasticity of demand studies, by location (*n*)

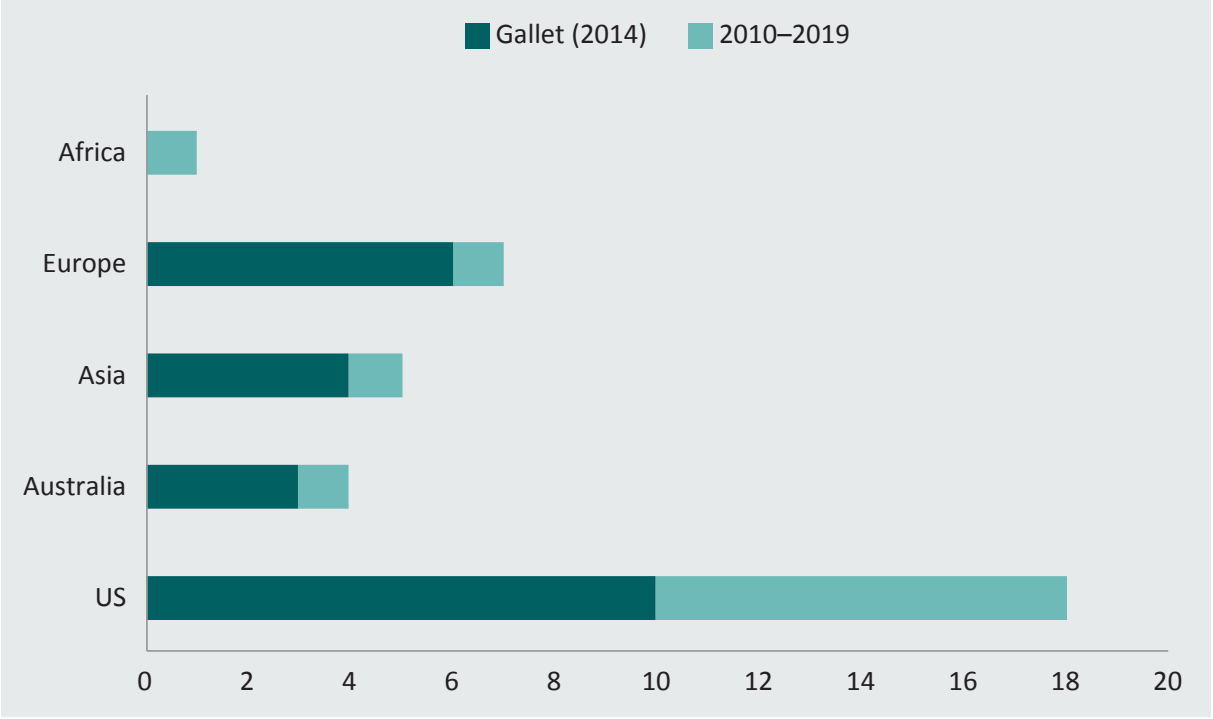


Table 1 reports the median price elasticity of demand from each study by drug type. This yields 44 median elasticities of demand for illicit drugs. Taking the average of these 44 yields a mean elasticity of demand for all drugs of approximately –0.9, indicating that demand for illicit drugs is inelastic—that is, the quantity demanded is not very sensitive to changes in price. In other words, a 10 percent increase in price would reduce the quantity demanded by approximately nine percent. This estimate is different to the figure of –0.33 reported by Gallet (2014), because Gallet (2014) combined both participation elasticity and elasticity of demand. Approximately half of the studies cited in Gallet (2014) focus on participation elasticity, which is typically lower than the price elasticity of demand. Pacula and Lundberg (2014) report participation elasticities ranging from –0.002 to –0.69.

Table 1: Overview of studies on price elasticity of demand for illicit drugs

				Median price elasticity of demand			
Study[a]	Drug type	Country	Experimental data	Heroin (H)	Cocaine (C)	Marijuana (M)	Meth/ amphetamine (A)
Nisbet & Vakil (1972)	M	US	Yes			–0.30	
Caulkins (1995)	C, H	US		–0.30	–0.36		
van Ours (1995)	H	Indonesia		–0.85			
Bretteville-Jensen & Sutton (1996)	H	Norway		–1.23			
Crane, Rivolo & Comfort (1997)	C	US			–0.49		
Grossman & Chaloupka (1998)	C	US			–0.37		
Petry & Bickel (1998)	H	US		–1.06			
Bretteville-Jensen (1999)	H	Norway		–1.51			
Chaloupka, Grossman & Tauras (1999)	C	US			–0.45		
Liu et al. (1999)	H	Taiwan		–0.93			
Caulkins (2001)	C, H	US		–0.84	–1.30		
Petry (2001)	C	US	Yes		–1.15		
van Luijk & van Ours (2001)	H	Indonesia		–0.22			
Bretteville-Jensen & Biørn (2003)	H	Norway		–0.91			
Bretteville-Jensen & Biørn (2004)	H, A	Norway		–0.99			–0.22
Sumnall et al. (2004)	C, A	UK			–2.44		–2.21
Clements & Daryal (2005)	M	Australia				–0.69	
Bretteville-Jensen (2006)	H	Norway		–0.77			
Chandra & Swoboda (2008)	M, H	India		–0.70		–0.33	
Jofre-Bonet & Petry (2008)	C, H	US	Yes	–0.90	–0.90		
Chalmers, Bradford & Jones (2009)	A, H	Australia	Yes	–2.11			–1.82
Roddy & Greenwald (2009)	H	US		–0.64			

Table 1: Overview of studies on price elasticity of demand for illicit drugs (cont.)							
				Median price elasticity of demand			
Study[a]	Drug type	Country	Experimental data	Heroin (H)	Cocaine (C)	Marijuana (M)	Meth/ amphetamine (A)
Chalmers, Bradford & Jones (2010)	A, H	Australia	Yes	–1.73			–1.66
Clements, Lan & Zhou (2010)	M	Australia				–0.65	
Collins et al. (2014)	M	US	Yes			–1.75	
Olmstead et al. (2015)	H	US		–0.80			
Chandra & Chandra (2015)	H	India		–0.34			
Lakhdar, Vaillant & Wolff (2016)	M	France				–1.90	
Davis, Geisler & Nichols (2016)	M	US				–0.73	
Aston et al. (2016)	M	US				–0.05	
Halcoussis, Lowenberg & Roof (2017)	M	US				–0.42	
Thompson & Koichi (2017)	C, A	US			–0.10		0.51
Vincent et al. (2017)	M	US	Yes			–1.37	
Vitaliano (2018)	H	US		–1.00			
Riley, Vellios & van Walbeek (2019)	M	South Africa				–0.55	
Average (mean)				–0.94	–0.84	–0.79	–1.08

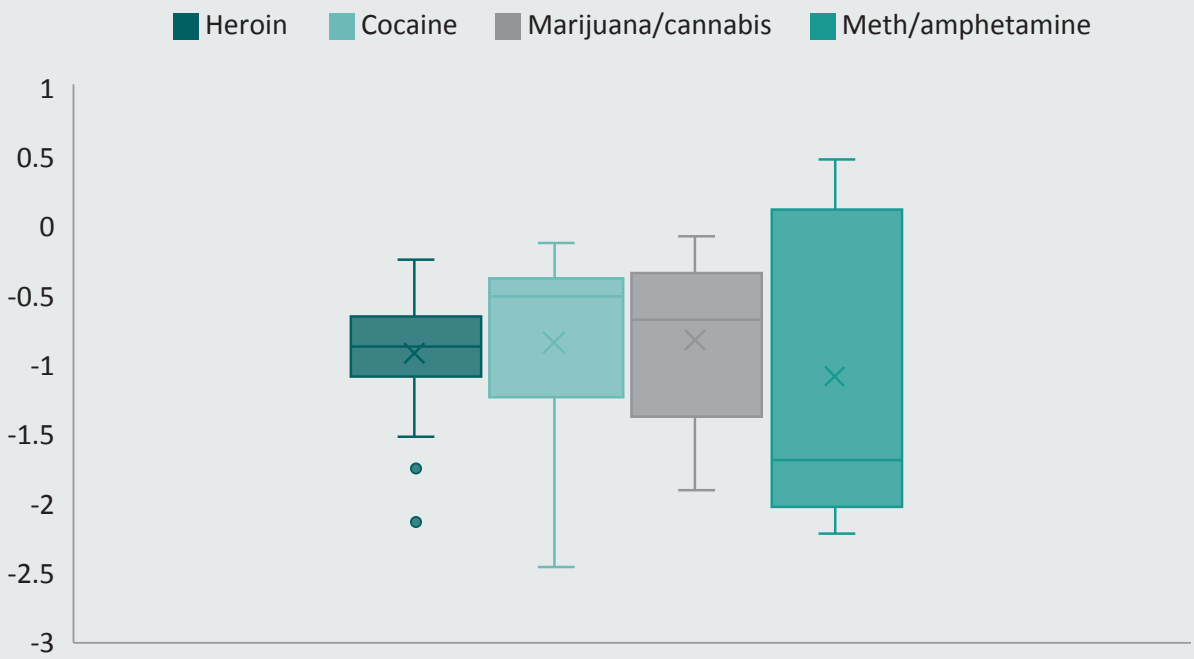
a: Full citations for these studies are provided in the *Appendix*, Table A1

Types of drugs

The average price elasticities of heroin, cocaine, marijuana and methamphetamine in our study are –0.9, –0.84, –0.79 and –1.08 respectively. Consistent with Gallet (2014), among the illicit drug types, demand for marijuana is the least price-sensitive. A study by Chandra and Swoboda (2008) also shows that marijuana use is less responsive to price change than heroin use. As marijuana is considered a 'soft drug', while heroin and cocaine are 'hard drugs' and more susceptible to drug dependency, at first glance this result appears counterintuitive. However, Gallet (2014) argues that a typical hard drug user would have more experience in the illicit drug market, and more information about drug prices and the availability of substitutes.

Figure 3 reveals the range of estimates of price elasticity of demand for heroin, cocaine, marijuana and methamphetamine. Methamphetamine has the largest variation, ranging from –1.82 to 0.51. Only Thompson and Koichi (2017) report a positive median price elasticity of demand for any drug—0.51 for methamphetamine. This suggests that methamphetamine may be a Giffen good (a product for which demand increases as price increases and demand falls when price falls), although the authors do not use purity-adjusted price for their elasticity estimates.

Figure 3: Price elasticity of demand, by type of illicit drug



Purity and quality of drugs

Thompson and Koichi (2017) argue that the positive elasticity for methamphetamine may be due to an increase in the quality of methamphetamine. Using Australian data, Scott, Caulkins, Ritter and Dietze (2015) also find that the price of and demand for methamphetamine has increased, a paradox that can be solved when purity is taken into account. Further evidence of the relationship between drug purity and price elasticity of demand is provided by Vincent et al. (2017), who find that demand for low grade marijuana is more price elastic (–1.97) than demand for higher grade marijuana (–1.11).

Ideally, to estimate price elasticity of demand, purity-adjusted price should be used. According to Bretteville-Jensen and Biørn (2004), police seizures show large variation in heroin and amphetamine purity at the wholesale level but little variation at the retail level. However, the purity is often unknown to the users at the time of purchase, so actual purity-adjusted prices may not be that important. What matters to demand is the perceived quality at the time of purchase rather than the actual quality. Researchers employ several techniques to control for drug quality when estimating the relationship between price and demand and their corresponding elasticities. For example, Bretteville-Jensen (2006) employs drug prices reported by participants and adjusted for decreases in heroin purity registered at the import level since 2000, whereas Olmstead et al. (2015) estimate elasticity of demand for high- and low-quality heroin separately. In the context of cannabis, Lakhdar, Vaillant and Wolff (2016) include both perceived quality and actual potency (based on the concentration of tetrahydrocannabinol) as control variables in their demand function regression.

Geographical differences

Price elasticity of demand appears to be country-specific. Table 1 shows that the average price elasticity of demand for heroin in the United States is –0.79, while in Australia and Norway it is –1.92 and –1.08 respectively. This implies that US heroin users tend to be less sensitive to price changes than either Australian or Norwegian users.

Among studies that investigate price elasticity of demand for heroin, Olmstead et al. (2015) employ an innovative dataset that combines longitudinal data collected daily from 120 US regular heroin users and experimental data. The authors employ two empirical strategies to estimate price elasticity of demand. The first strategy is to examine the longitudinal pattern of drug purchasing, exploiting the within-individual idiosyncratic variation in price. The second strategy uses experimental data and exploits an experimentally induced variation in price. Both strategies yield an estimated price elasticity of demand of –0.8. This estimate is consistent with the average of the other US-based heroin studies (–0.79). While there is a sizeable difference in heroin price elasticity between the US and Australian markets, average elasticities for marijuana are similar (–0.77 vs. –0.67).

With regard to cocaine, most studies in the US market report inelastic demand (elasticities are negative and less than one in absolute value), with the exception of Caulkins (2001) and Petry (2001). Our review identified one additional UK-based study, which estimates the price elasticity of demand for cocaine (–2.44) and for amphetamine (–2.21; Sumnall et al. 2004). Thus, while demand for cocaine in the United States appears to be inelastic, the limited available evidence from the United Kingdom suggests a higher price elasticity of demand.

User effects

According to Pacula and Lundberg (2014), different types of drug users respond differently to changes in price. Four groups of users are identified: initiators and light users, regular users, heavy users, and quitters. For marijuana, initiation among youth is sensitive to changes in price, with initiation (or participation) elasticity ranging from –0.002 to –0.69. With regard to regular marijuana users, Nisbet and Vakil's (1972) study, albeit dated, estimated the elasticity of demand (capturing the change in consumption among those already using marijuana) to be approximately –0.3. The participation elasticity of this group is approximately –0.7 to –1.0, resulting in a total elasticity of demand ranging from –1.01 to –1.51.

Clements and Zhao (2009), as cited in Pacula and Lundberg (2014), estimate elasticity for regular users as –0.4. Aston et al. (2016) report elasticity of demand among frequent marijuana users as –0.04 (whole sample), –0.055 (users without symptoms of dependence) and –0.038 (users with symptoms of dependence). There has been little research into the behaviour of heavy users, although Lakhdar, Vaillant and Wolff (2016) estimate elasticity of demand for marijuana in a sample of 250 heavy (near daily) users in France. They report short-run elasticity ranging from –1.7 to –2.1—much higher estimates than appear elsewhere in the literature.

Gender effects

There appears to be a gender difference in responsiveness to changes in the price of illicit drugs. Bretteville-Jensen (1999) suggests that women are more price-sensitive than men. The author estimates heroin demand equations for females and males separately. Regression results show that price elasticity of demand is –1.9 among females and –1.5 among males. Gallet (2014), however, finds no gender differences in price elasticity.

Cross-price elasticities

When estimating the demand function for a given drug type, some studies control for the price of alcohol, tobacco or other illicit drugs, reporting their respective cross-price elasticities. Gallet (2014) indicates that controlling for the impact of the cross-price elasticity of alcohol (other illicit drugs) on the own-price elasticity of a given drug will inflate (or deflate) the own-price elasticity. Olmstead et al. (2015) suggest that marijuana and heroin are neither complements nor substitutes, whereas cocaine and heroin are complements. In this context, a complement is a drug for which demand increases when a similar drug becomes cheaper (ie people use both drugs and, as one becomes cheaper, the other also increases in demand). A substitute is a drug whose demand increases when the price of another drug increases (ie users switch to substitutes when their preferred drug becomes more expensive). Saffer and Chaloupka (1999) also propose that cocaine and heroin are complements. Thompson and Koichi (2017) find that past marijuana consumption does not increase current cocaine or heroin consumption. Changes in marijuana price also do not affect consumption of these two drugs. Marijuana, however, is a weak complement to methamphetamine. There is little evidence of drug substitution from heroin to methamphetamine, despite declines in the purity-adjusted price of methamphetamine (Scott et al. 2015).

Types of data

Elasticity estimates depend on the type of data used. Estimates from experimental data tend to be larger in absolute value, compared to estimates from historical or crowdsourced data. This finding is consistent with Gallet (2014). For example, with regard to the US marijuana market, Davis et al. (2016) report elasticity ranging from –0.67 to –0.79 using crowdsourced data, whereas Collins et al. (2014) and Vincent et al. (2017) report higher elasticities of –1.75 and –1.37 respectively using experimental data.

A final potential driver of variation in price elasticity of demand is whether short-run or long-run price elasticity is being estimated. The length of time people have to respond to price changes affects the elasticity of demand. In general, demand tends to be more elastic in the long-run because people have more time to notice the change in price and act accordingly (Mankiw 2004). Consistent with Gallet (2014), we also find that demand for drugs is more elastic in the long run.

Discussion

Supply reduction is one of three pillars underpinning Australia's commitment to harm minimisation within the National Drug Strategy 2017–2026. Supply reduction has two principal aims: to curb onset and consumption by limiting opportunities for drug use, and to reduce drug use by manipulating the drug market in ways that discourage use and reduce demand. In econometric studies of illicit drug markets, price is an important market characteristic which has the potential to influence the behaviour of drug users. However, the extent to which drug users are, in fact, sensitive to price changes remains the subject of some debate. In this study, we systematically review and consolidate the most recent available empirical evidence on the price elasticity of demand for illicit drugs. To do this, we extend an earlier review by Gallet (2014) with an additional 12 articles published between 2010 and June 2019.

Together these studies suggest that the demand for illicit drugs is, on average, weakly price inelastic. By our estimate, a 10 percent increase in the price of illicit drugs results in a decrease in demand of approximately nine percent. Although technically inelastic, this result suggests law enforcement activities that increase drug prices can have a substantial effect on the quantity demanded—almost a one-to-one relationship. This estimate is considerably higher (ie more elastic) than was estimated by Gallet (2014). However, as mentioned earlier, Gallet's sample included a number of studies that estimated the price elasticity of participation, and participation elasticity is typically lower than consumption elasticity (Pacula & Lundberg 2014).

By drug type, price elasticity of demand is highest for methamphetamine (an average of –1.08—indicating elastic demand). However, this estimate is based on a small number of studies (five in total, including two from Australia) and it should therefore be interpreted with caution. Using a behavioural economic approach in an Australian context, Chalmers, Bradford and Jones (2010, 2009) suggest that methamphetamine is highly price elastic, particularly among those who are not drug-dependent (an elasticity of –1.66; *n*=101). Methamphetamine is also found to be price elastic in the United Kingdom but inelastic in the US and Norwegian markets.

Given the relatively small number of studies estimating the price elasticity of demand for methamphetamine and the growing social harms caused by this type of drug, there is a strong case for the development of a well-designed experimental study. Such a study should be multi-jurisdictional, include purity or quality adjustments, attempt to estimate the degree of substitution between methamphetamine and other drugs, and explore the price sensitivities of different user groups.

Demand for all other drug types was assessed as inelastic, and the link between price and demand was weakest for marijuana (an average of –0.79), followed by cocaine (–0.84) and heroin (–0.94). Consistent with earlier analyses and with economic theory, price elasticity of demand tends to be lower in the short-run than in the long-run. Further, it appears that the relative purity of a substance matters, and that some of the apparent inelasticity between price and demand may be explained by fluctuations in purity or quality.

Although the number of studies included in this systematic review is relatively small, a number of important trends are worth noting. First, price elasticity of demand appears to be specific to the local or regional context. This makes it difficult to translate the findings from one country to another or from one market to another, even within Australia. This geographical variability points to a number of important local conditions that likely impact the relative effectiveness of law enforcement strategies seeking to manipulate drug price as a mechanism for curbing demand.

Second, a change in price is not experienced or responded to equally by all drug users. Price increases, for example, are likely to have a greater impact on existing users than on potential new users. Third, it appears female drug users are more sensitive to price changes than male drug users. Finally, cross-drug substitution is a feature of drug market activity that likely affects the calculation of demand elasticities. The extent to which drug users are prepared to switch between drugs as relative prices change should be the subject of future research.

Although in this analysis we focus on price elasticity of demand, it is important to acknowledge that price increases are not the only possible outcome of a reduction in supply. Suppliers may alter their drug market strategies in a number of other ways, some of which can significantly increase harm rather than reduce it. For example, to maintain street-level supply at consistent prices, suppliers may increase the use of cutting agents and other adulterants. By decreasing the purity of their product, suppliers can manage short-term supply reductions, albeit at significant detriment to the health of their customers. The demand reduction benefit of any supply reduction strategy must be weighed against these other potential outcomes and the hidden harms that can result.

Further, the measure of elasticity in drug markets cannot be considered in isolation from the cost (both financial and social) of producing the requisite changes in supply. As noted earlier, law enforcement is responsible for approximately two-thirds of current expenditure in drug policy (Shanahan & Ritter 2013) and many drug market interventions are of limited or unknown benefit (Mazerolle, Soole & Rombouts 2007). In addition, law enforcement activities have been shown to result in a number unintended and sometimes negative consequences to both drug users and the wider community. Any quantitative or qualitative assessment of price elasticity should not be interpreted in isolation of the cost of reducing supply. Indeed, it would be important for future research to consider the relative benefit of supply reduction strategies when weighed against their financial and non-financial costs.

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Appendix

Figure A1: Preferred reporting items for systematic reviews and meta-analyses (PRISMA)

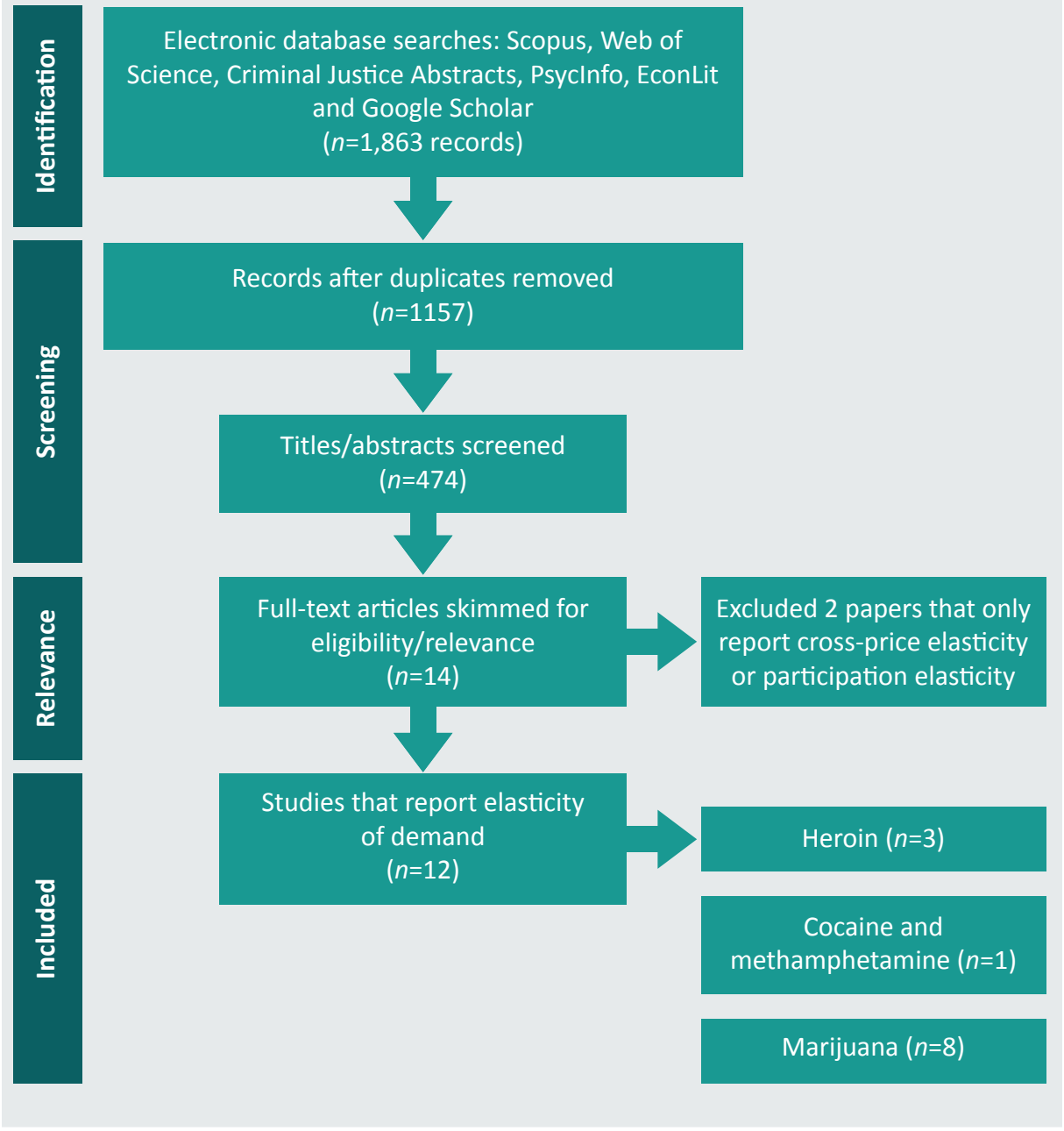

Table A1: Full citations for all studies included in this systematic review
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