

Deliverable 7.1:

Determinants of risky substance use and risky gambling: an interdisciplinary review ^{1) 2)}

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Abstract

Addiction as a clinically defined disorder does not develop “overnight”, but can be characterized as a developmental process with critical thresholds from low risk to risky and harmful use. These processes are highly individual concerning duration, pattern and problem severity. A better understanding of individual and social risk and protective factors which modulate these developments is needed to improve public policy, prevention and early intervention. This work examines our current understanding of the determinants of risky substance use and risky gambling behaviour, from a range of disciplines within the field of addiction research. Our expert analysis of the existing research literature has highlighted a number of factors which promote the risky use of substances or risky gambling behaviours including the social environment, social status, availability, a young age of initiation and impulsivity. These determinants operate across multiple disciplines, from the molecular and cellular to the social and environmental, with the multidisciplinary convergence on such key concepts promoting their validity. A key finding was the overall lack of research into this initial key stage of use. Additionally, we exposed the inconsistencies within the literature regarding both definitions of risk and risky behaviours and definitions of the determinants of such behaviour, further hindering cross-study comparisons. This lack of research focus beyond the narrow concept of addiction prevents early intervention prior to the development of problematic behaviours. It is hoped this knowledge can be used to inform future policy making decisions across Europe and provide a basis for progress in treating outcomes related to substance abuse and gambling problems.

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1. INTRODUCTION

The science of addiction emerges from diverse fields of study, such as genetics, sociology, neurobiology, psychology and economics. This research has resulted in significant advances in our understanding of addictive substance use and addictive behaviours, what predicts them and the outcomes they may lead to. However, our understanding is fractured and knowledge from across the scientific disciplines is too rarely brought together. As a result, addiction science as a whole is rather like the tale of “The elephant and the blind men”; each man touches and describes one part of the animal, but none can describe the whole beast.

Even when analysing the same underlying questions, scientific disciplines often vary in their research foci, methods, data and outcomes. These differences are not trivial and can act as hindrances to the integration of scientific knowledge and are also the trigger for much debate and disagreement. Overcoming these hindrances would permit more interdisciplinary approaches to science, in which data from a range of disciplines could be more effectively synthesised. By allowing us to see the ‘whole beast’, such approaches can enhance our understanding of current evidence, highlight new solutions to problems and signpost productive avenues for future, possibly cross-disciplinary, research.

A prime target for interdisciplinary study in addiction science is the identification and analysis of factors associated with the process of engaging in addictive substance use and gambling. In different ways and to different degrees, scientific disciplines have sought to understand the characteristics of individuals and the contexts of engagement which are associated with particular behaviours or outcomes. Identifying these behavioural determinants or risk factors can lead to better targeting and design of preventative and clinical interventions and public policy at all societal levels. It can also provide a more comprehensive understanding of how and why individuals and societies engage with and respond to addictive substance use and gambling in particular ways.

However, when identifying determinants of engagement in addictive substance use and gambling, it is important to remember that all forms of engagement cannot be seen as equal and that for different forms of engagement determinants may vary. For example, regular heroin use is different to regular alcohol use, a small weekly bet on a football match is different to compulsively playing internet poker and drinking two alcoholic drinks a day is different to drinking fourteen alcoholic drinks once a week. Therefore, addictive substance use and gambling need to be broken down into more narrowly defined behavioural concepts, such as initial use, risky use, harmful use, addiction, cessation or chronic relapsing. Understanding the

determinants of these specific forms of behaviour allows a more focused understanding of where interventions are required and how addictive substance use and gambling behaviours may emerge, extinguish, escalate, deescalate or fluctuate over time. Further, it allows addiction science to move away from a narrow focus on addiction per se and onto other important concepts such as risky behaviour, harmful behaviour in general and 'recovery' the related developmental processes.

1.1 Scope and Purpose

This is the first of a series of three reports describing the findings of an interdisciplinary study on identifying the determinants of different stages of addictive substance use and gambling behaviour using evidence from a range of scientific disciplines. This report focuses on identifying determinants of risky substance use or risky gambling. The following two reports will focus on determinants of harmful outcomes and determinants of chronic continuation or reduction of problematic substance use or gambling respectively.

The aim of this report is to compile and integrate the existing evidence of determinants of risky substance use or risky gambling from seven disciplines: anthropology, economics, genetics, neurobiology, psychology, public policy and sociology. The substances covered by the report are predominantly alcohol, tobacco and illicit drugs but our findings are seen to be valid for the developmental processes of all psychotropic substances. Further additional information on gambling is covered to illustrate specific aspects of the processes to develop 'behavioural addictions' like pathological gambling. A set of determinants will be drawn from each discipline and these will be single factors, either individual-specific or environmental, which may influence whether an individual engages in risky substance use or risky gambling. Models or theories describing the interactions of multiple determinants and how these interactions lead to risky behaviour will also be identified. These will contribute to our efforts to synthesise evidence from across scientific discipline as such models and theories often draw on evidence from multiple disciplines.

This research report will outline the principal current evidence from each discipline, highlighting complimentary and contrasting data and discuss the implications of this body of evidence for both policy makers and researchers. A companion report will seek to present an interdisciplinary logic model mapping the determinants of risky substance use and risky gambling, the evidence for these determinants and, where evidence permits, how these

determinants interact in influence risky behaviour. The companion report will also, where data and evidence permit, provide estimates of transition probabilities describing the likelihood of an individual, under a specific set of both innate and environmental conditions, progressing from one behavioural stage to the next (e.g. from abstinence to binge drinking).

In conjunction with the other two reports in this series (WP7-9), it is hoped that the synthesis of current scientific knowledge on different forms of engagement with addictive substances and gambling will afford policy makers a comprehensive understanding of this topic and assist them in the planning of further strategies to tackle addictive substances and behaviours across Europe. Further, by taking an interdisciplinary approach, substantial gaps in current evidence or missing links between the disciplines may be more easily identified, thereby providing a focus for future research and funding. Finally, it is hoped that this report begins to better integrate the different disciplines dealing with addiction studies and provides a model of how these diverse sciences can be brought together to foster interdisciplinary research which translates into policy responses which improve societal well-being.

The remainder of this introductory chapter provides a brief overview of two areas which frame this research. Firstly, a description of different scientific methods is provided with a view to identifying how these impact on interdisciplinary studies such as this one. Secondly, an overview of how individuals and societies engage with concepts of risk and how these considerations are operationalised within this report.

1.2 The challenge of integrating evidence from different scientific methods

Scientific disciplines may take a number of approaches towards scientific understanding, including positivism, realism, interpretivism, objectivism and constructivism. Each has a different perspective on valid sources of evidence and a set of principles about the way the object of study (e.g. society) works to which new evidence can be applied. The most common approach to understanding the different underlying approaches of scientific disciplines is to make the somewhat crude distinction between the positivist natural sciences and the constructivist social sciences.

The natural sciences, including physics, biology and chemistry and parts of psychology, fit more comfortably within this distinction as their approaches are overwhelmingly positivist. The key

feature of positivism is an emphasis on the use of repeated observation and measurement as a means to explain the underlying reasons for certain behaviours. This approach, which essentially proposes that the world can be understood through objective and rational quantification and categorisation, lies at the core of what became known as 'the scientific method'. To identify determinants of a particular outcome, statistical tests are typically used to measure how closely associated the determinants and the outcome are, how additional factors may alter this relationship and whether other potential explanations for this association can be ruled out. To enable this, both the determinant and the outcome must be amenable to objective measurement or categorisation and considerable effort is often invested in constructing suitable tools which can reliably measure complex concepts such as personality, well-being and addiction. The positivist approach has been criticised for, amongst other things, reducing a hugely complex social world to numbers and categories and for adopting an approach which prioritises measurement and analysis by distant scientists over the observations of individuals with close personal experience.

In contrast, social science has tended towards a more constructivist approach whereby objective measurement is not ignored but is deprioritised, partly due to the perceived difficulty of objectively measuring or classifying important concepts for understanding society such as power relations, political philosophy or youth culture. Instead, concepts are often subjectively defined through detailed description. Particular attention is paid to how different constructions of the meaning and purpose of a concept may emerge when viewed in the context of interrelations between individuals and different levels of society, such as families, subcultures, institutions and nation states, and the practices, values and beliefs which are embedded within each of these social units. Constructivist approaches have been particularly criticised for treating subjective opinion or anecdote as robust evidence and for providing deep understanding that lacks validity beyond the case in point.

A comparison of the criticisms of positivism and constructivism highlights that, at the heart of the distinction between these two approaches is a debate as to whether there is an objective reality which can be understood with sufficient scientific effort or whether, to some extent, the world should be understood subjectively as humans and societies act on the basis of viewing the world through their own lens rather than through a universal set of well-defined truths.

The crudity of the positivist vs. constructivist distinction is worth noting as although it highlights important differences between scientific disciplines, it is particularly caricatured for social science. Some social sciences, such as psychology and economics, have strong positivist slants and many of those working in other disciplines, such as sociology and anthropology, do

not reject objective measurement per se, but simply try to provide further evidence to interact with it. Nor are positivism and constructivism the only approaches used across the scientific disciplines, they simply provide a useful contrast for elucidating key divergences in scientific methods.

The underlying approaches which inform scientific disciplines are not simply philosophical points. As described above, they contribute to decisions about the kind of data which is regarded as acceptable evidence and where scientific effort is focused. As such, different disciplines have developed starkly different methods. For example, the repeated experimentation and sophisticated well-defined measurement tools of natural science contrast sharply with the text-based description and recorded speech reflections collected in sociological and anthropological studies. Similarly, the carefully quantified statistical relationships between determinant and outcome identified by positivist science sit uncomfortably with the richly contextualised connections between cause and effect theorised in constructivist data.

These divergences present important challenges for this project. Although, determinants of risky behaviour drawn from positivist research are often straightforward to list and statistical analyses allow them to be arranged into evidence-based models, the broad concepts discussed in constructivist research and their varying meanings and complex interconnections make them less easy to succinctly summarise or to arrange into easily accessible models in informative ways. Part of our work represents an attempt to develop working practices and research methods which can address these challenges.

1.3 Risky substance use and risky gambling

The determinants of risky substance use or gambling which are the focus of this report may not equate to determinants of actually experiencing harm or addiction; however, they are predictive for future harms to the mental or physical health and well-being of the individual and those around them. Therefore, an understanding of why humans engage with risky activities and how societies make decisions in response to this is required to frame our descriptions of determinants of risky substance use and risky gambling.

1.3.1 Why do we take addictive substance?

Although addictive substances and behaviours are typically discussed, particularly in policy debates, in terms relating to their harmful aspects, clearly human engagement with them is not simply motivated by a desire to harm ourselves. Instead, these substances and behaviour serve several purposes for individuals which should not be side-lined when considering interventions. At a neurobiological and psychological level, psychoactive substances may be engaged in to increase sensations including pleasure, sedation, pain relief or alertness, which in turn can promote further episodes of use. For example, humans have evolved natural mechanisms which reward behaviours useful to ensuring the continuation of the species. When engaging with rewarding behaviours, the brain releases neurotransmitters such as dopamine which are important in reinforcing the positive effects of drug use and motivating further experimentation. Drugs of abuse mimic these natural rewards by evoking dopamine release and thus reinforcing positive effects of drug use and motivating further experimentation.

However, the neurobiological and emotional effects of a drug do not act in isolation, but rather form part of a framework for drug use that includes the environment and society in which they are used. For example, in addition to their effects as a depressant and sedative, alcoholic drinks have also been assigned, through a range of social processes, strong cultural meanings and values including signifying commensality or fellowship or various ritual meanings when toasting, taking Holy Communion or celebrating sporting victory. Of course, neurobiological, emotional and cultural purposes do not act in isolation and celebratory drinking is not free from intoxicating effects from neurological processes. The same is true for other addictive substances and behaviours, for example, sharing a cannabis joint is both an intoxicating experience and a social ritual.

If the motivations for engagement with addictive substance and behaviours mix the individual and the social, the determinants are no different. Consuming addictive substances or engaging in gambling is inescapably a personal behaviour; individual differences in personal tastes and resources, biological processes around feelings of satiation and intoxication and current mood, expectations and goals will all contribute to decision-making. However, behaviour is also shaped at multiple levels by social context, culture and society in addition to the individual-level factors which determine behaviour. Influences such as the expectations of others, the prominence of particular behaviours in a given social milieu or restrictions laid down by societal authorities may dictate behaviour beyond personal preferences. Indeed preferences themselves may be shaped by these influences. How, when, where, how much and how often engagement with addictive substances and behaviours occurs is likely to be determined by the complex interplay between the individual and the societal. To focus exclusively on any one

aspect of these domains is to fail to recognise that individuals and societies are inextricably intertwined. It is this point which underpins for necessity for a study such as this to be interdisciplinary.

1.3.2 What is risky use and behaviour?

Tensions between the individual and the societal and between scientific approaches also inform our understanding of what the concept of 'risk' means. Risks to the individual from consumption of licit addictive substances, such as tobacco and alcohol, are well-documented by epidemiologists, although it is recognised these may vary dependent on the user and the extent, pattern and substance of use. In line with positivist methods, risks are classified as such because the statistical likelihood of experiencing an undesirable outcome (e.g. premature mortality) is increased at certain levels of smoking or drinking relative to not smoking or drinking. Therefore, it may seem uncontroversial to view cigarette smoking as risky. However, four problems with this approach can be identified.

Firstly, as described above, addictive substances are consumed for many reasons and, for an individual, these may be traded-off, probably in a somewhat irrational fashion, against the loss of life years.

Secondly, focusing on the relatively straightforwardly measurable outcome of premature mortality tends towards an implicit philosophy that human interaction with risk is simply a quest to avoid harm in general and death in particular. Gusfield (1996) has argued cultural and subcultural perceptions on risk and how individuals engage with it are more complex, change over time and evolve with personal experience in several ways. Perception of risk, beyond simple knowledge of scientific evidence, matters and individuals subjectively assess whether perceived general risks from behaviours apply equally to them. Cultural framing of risk is also important and informs individuals as to whether their particular status and situation mean they should be paying attention to warnings and seeking to avoid risk. Self-perception influences decisions as to whether, if something adverse begins to happen, the individual is confident this can be handled or countered. Finally, there is much evidence of subcultures where engagement with risk is regularly sought out as a form of recreation and participants set limits to their behaviour on their own terms (Lyng, 1990, 2005; Nahoum-Grappe, Martinic & Measham, 2008; Cosgrave, 2008; Reith, 2005).

Thirdly, attention is also rarely given to how risks from addictive substance use compare to risks from other activities which are regarded as low or high risk. Some have argued that low risk drinking guidelines should be set with reference to risks from uncontroversial daily activities (e.g. driving) (Stockwell & Room, 2012). Others have provoked consternation by

comparing the risks of ecstasy use to the risks of horse-riding (Nutt, King & Phillips, 2010). This reflects a reality that the risky activities which concern societies are not demonstrably those activities that carry the greatest risk, although in some cases this may be true, but rather those activities which are embedded in public and political discourse as activities to be restricted, controlled or worried about. Addictive substances and behaviours are a case in point as these are heavily moralised and subject to either prohibitory or regulatory frameworks, engagement with them often conveys strong social meaning and may lead to stigma and this can be particularly focused on the marginalised ‘misusers’ as opposed to a more responsible mainstream (Peele, n.d.; Room, 2011).

This leads to a fourth point, that risks may be modified by a society’s responses to the risk behaviour. Although epidemiological research on licit substances is relatively well-developed, the same cannot always be said for illicit substances and, even where this evidence is available, it does not always translate logically into policy responses. Thus societal restrictions on addictive substance use do not always appear to logically reflect the epidemiological evidence of risk from use of that substance and, in some cases, prohibitions, restrictions and policy responses may contribute to the risk through the imposition of punitive sanctions, the creation of problematic illicit markets and the withholding of protective measures. These restrictions may vary between societies presenting sharp disconnects in what the risks of engagement in a particular behaviour are in different contexts. For example, many Western cultures embrace drinking, but risks of censure are high in Islamic states and high provision of needle exchanges may greatly reduce risk of blood-borne infection in some contexts but be only sporadically available in others. As a result of this, any risk to health from a particular behaviour may be outweighed by risks from the behaviour which are wholly the produce of how society has developed its response to the behaviour.

Given the above, evidence on the determinants of a particular risky behaviour should be seen also as socially produced rather than only a reflection of inherent riskiness and it should be considered alongside a broader spectrum of ideas about how society should engage with risk, how we should contextualise quantifications of risk and how risks emerge.

1.3.3 Risky substance use and risky gambling in this report

Defining risk and assessing determinants of it within this report has several further challenges. Risks are present across multiple domains of including mental and physical health, well-being, crime and economic concerns. Risks can also vary markedly dependent on the psychoactive effects of substances and the patterns of use and the same is true for forms and patterns of

gambling. Variation in risks between and within cultures and time periods also need to be considered.

The level of engagement in addictive substance use and gambling which should be considered risky also requires consideration. For some substances (e.g. crack cocaine) any use may be considered risky. For others, institutions provide guidelines for low risk use such as drinking guidelines (NICE, n.d.). Governments may also impose limits for particular situations and these may both imply where use becomes risky use and also create this situation by imposing sanctions for using above this level. Examples include drink-driving limits, smoking bans in particular locations or minimum purchase ages for licit substances and gambling.

Risks may also not be straightforward to classify as engagement may have potential beneficial effects at lower-levels but potential harmful effects at higher levels, for example the J-shaped relationship between level of alcohol consumption and risk of heart disease. For other outcomes there may be threshold effects where risks only increase above certain levels and, in other cases, risks may increase sharply beginning with minimal levels of use.

To incorporate all of these considerations, we have created a definition of risk substance use and risky gambling for this report which encompasses a broad ranging set of meanings.

2. METHODS

2.1 Definition of risky substance use and risky gambling

This report focuses on the determinants of individuals engaging in risky behaviour in relation to substance use and gambling and the dangers of progression from such behaviour to harmful use. Risks can be inherent to behaviour as well or may be attributable to social reactions to the behaviour. For the purposes of this report and used in consideration with the discussions in Section 1.3, the agreed definition of risky behaviour is:

“All expressions of substance use and gambling, in terms of quantity, frequency, pattern and situational circumstances (e.g. location, time) which are material predictive factors for short- or long-term individual harm, or harm to others including society at large”

Within the above definition, the term ‘material predictive factors’ refers to the standards by which risk is judged to be of sufficient magnitude to be considered relevant and it should be noted that this may vary across disciplines. Risky behaviour can be categorised into short term and long term risk. Short term risk, such as drink-driving or the use of unsterilized needles for injecting practice, is limited in duration with risk levels returning to baseline following the event. However, long term risks, such as persistent cannabis use or drinking whilst pregnant, extend beyond the initial use of the drug with risk of harm typically accumulating over the duration of drug use. Both short and long term risks can pose harm to the individual, society, or both. Harms to society may be to individuals (e.g. through theft to fund drug purchases) or to society at large (e.g. through costs to public services).

2.2 Research method and process

This report is based on a synthesis of evidence from seven disciplines on the determinants of risky substance use and risky gambling. The disciplines involved are anthropology, economics, genetics, neurobiology, psychology, public policy and sociology. Further evidence was provided by experts on gambling, comparative European studies and youth studies. The research team is made up of leading addiction scientists from each discipline in addition to the project management team and a science writer responsible for evidence synthesis.

The report was completed through three overlapping processes. First, each expert produced a review of the relevant evidence from their discipline; second, these reviews were integrated

into a synthesis report by the science writer and, third, consensus meetings were held to discuss evidence from each discipline and drafting of the synthesis report. The descriptions of the research process below outline how and when this process took place.

2.2.1 Timings of process

An initial meeting of the project's partners in May 2011 defined the work schedule for this research project; including a preliminary timeline for meetings, the outcomes for dissemination and the proposed format and content of the discipline reviews.

At a consensus meeting in November 2011, discipline experts presented early drafts of their expert reviews and the partners agreed the definition of risky behaviour and further refined the format and content for discipline reviews. Experts then worked independently or in collaboration with epistemologically-similar disciplines to review relevant literature and draft expert papers by April 2012. The reviews were circulated to all group members to increase awareness of differences between disciplines and to facilitate interdisciplinary communication. Using each of these reviews, a draft of this synthesis report was produced by a science writer outlining key concepts, theories and determinants identified by the different disciplines. This draft report was circulated to the research team in May 2012 prior to a second consensus meeting in the same month.

At the meeting, final clarifications on the nature and content of discipline reviews were agreed to ensure comparability between papers and facilitate interdisciplinary synthesis. Discussion of the draft synthesis report also led to substantial revision and refocusing of the content to permit a more critical appraisal of the existing literature. Discipline reviews were subsequently revised and finalised by experts for July 2012 and a second draft of the synthesis report was produced for October 2012. This was discussed by experts in a final consensus meeting in October 2012 and subsequent revisions led to the completion of the final report in November 2012.

2.2.2 Structure of reviews

Each disciplinary review was a comprehensive and objective review of the state of the art within that discipline. Addictive substances or behaviours covered by the reviews were alcohol, amphetamines, cannabis, cocaine, ecstasy, gambling, hallucinogenic substances, opioids, synthetic drugs, and tobacco. Reviews were structured to be a narrative review of between 7000 and 10,000 words. Each review contained a statement of methods including any inclusion and exclusion criteria used to select studies as well as evidence on both theory and determinants of potentially risky substance use or gambling. To aid and foster interdisciplinary

working, single disciplines were separated into four clusters representing their typical level and methods of analysis:

- ***Social and environmental focus***

Cluster 1: Public policy and economics

Cluster 2: Sociology and anthropology

- ***Individual focus***

Cluster 3: Economics and psychology

- ***Cellular and molecular focus***

Cluster 4: Genetics and neurobiology

The social and environmental level includes anthropology, sociology, public policy and economics, and analyses the interactions between and within large groups or societies, their perspectives and motivations and the characteristics of those groups or societies which influence risky substance use or gambling. The individual group contains psychology and economics which examine the thoughts, emotions, behaviours and decision-making processes of individuals engaging in risky behaviours and how these vary from those who abstain from doing so. The cellular and molecular level examines how risky behaviour may stem from inherent or environmentally-induced biological changes. Economics operates at both the individual- and the social environmental-level depending upon whether one is considering micro- or macro-economics. To a lesser extent, this is true for other disciplines, although, for convenience, they have been included within a group which contains the majority of their focus.

2.2.3 Literature search and study selection

Experts in each discipline considered literature using the agreed definition. Consultation with other discipline experts as well as between disciplines aided identification of relevant literature. No limits were put on the design or methodologies of studies included in reviews and, consequently, the studies are as diverse as the sciences represented and span historical analyses, qualitative research and micro- or macro-level quantitative methods to laboratory-based, clinical and epidemiological approaches. Rigid systematic review methods were not used since the aim of this analysis was to summarise not catalogue the large scope of available evidence. This is beneficial since each discipline has different approaches to reporting and

analysing evidence, and this inclusive approach allows important contrasts and comparisons to be made between very different forms of evidence. Appropriate search databases were used for each discipline, with articles written in English only considered.

2.2.4 Evidence synthesis

Each discipline review was examined to identify the key determinants and models that contribute to risky substance use and risky gambling. Determinants which were mentioned in multiple disciplines were examined further to understand whether combining information between the two or more reports may provide further insight into the role of this determinant in risk. As this process developed, disciplinary boundaries became less relevant and, consequently, results are not presented by discipline and are instead structured around four areas of research; models of decision making, psycho-social and psychological models, influences on risky behaviour within population sub-groups and societal framings and frameworks for risky behaviours.

3. RESULTS

Over the following pages, a synthesis of the discipline reviews is presented. The text is structured so as to focus on four areas of research in turn. These are:

1. Models of decision-making
2. Psycho-social and psychological models
3. Influences on risky behaviour within population subgroups
4. Societal framings and frameworks for risky behaviours

None of these sections is the domain of a single scientific discipline and each draws on evidence from other similarly-focused, and occasionally disparate, disciplines. Each section presents a series of theories or models which offer explanations for why particular groups are more or less likely to engage in risky substance use or risky gambling. Individual determinants of risky behaviour are noted throughout but are not explicitly listed until the end of this chapter where they are presented in a comprehensive table.

3.1 Models of decision-making

The first set of models describe scientific efforts to understand how individuals make decisions and how this has been applied to engagement in risky substance use and risky gambling. Research efforts have been particularly focused on understanding which parts of the brain are involved in decision-making and how different decision-making processes interact to produce decisions in different individuals and circumstances. In both economics and neuroscience, a focus of this stream of research has been to understand the biases which impact on so-called 'rational' decision-making and systematically lead to choosing one behavioural response over another. This stream of research has led to engagement in addictive substance use and behaviours being, somewhat uncomfortably, accommodated within the rational consumer model which is an important aspect of welfare economics.

3.1.1 Dual decision theory

Individuals constantly make choices about their actions and how to proceed in different situations, including whether or not to engage in addictive substance use or gambling and to what level. Despite the numerous possible factors that may impact on one's decision, behavioural economics has posited that the decision-making process can be simply split into two separate decision systems operating within the brain (Fig. 1). This model is termed dual decision theory.

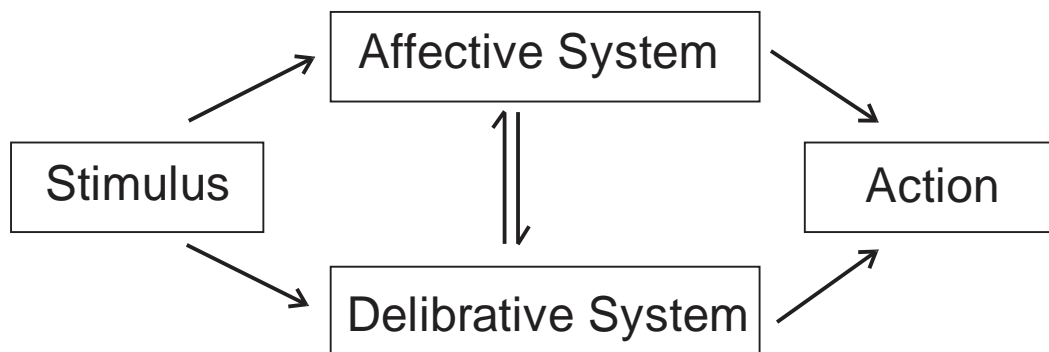


Figure 1: The dual decision theory. Both deliberation and affect contribute to an individual's decision-making processes (Loewenstein and O'Donoghue 2007).

The affective system of decision-making is concerned with immediate outcomes from decisions and controls basic motivational states such as hunger, sexual desire and tiredness (Loewenstein & O'Donoghue 2007). It can be thought of as a system which responds rapidly to impulses, in a largely unconscious manner, and can be likened to one's gut instinct as it is associated with emotion. The affective system is located in the limbic system of the brain, consisting of the hippocampus, amygdala, the hypothalamus and several other nearby areas. The second decision system, the deliberate system, is involved with reflective thought and is located in the more recently evolved cortex regions. The deliberative system is cognitively more sophisticated than the affective system. It is deductive, effortful and controlled, yet operates more slowly.

The affective and deliberative systems interact when an individual makes decisions, and the balance of their interaction determines the resultant action of the individual. Both the affective and deliberative decision-making systems and the relative balance between them can be affected by factors which bias the individual's decision-making in one direction or the other. The following section outlines some of the major biases in individual decision-making that are relevant to risky use of addictive substances or risky gambling. These suggest engagement in

risky substance use or risky gambling may be explained by variation between individuals in the decision-making process.

3.1.2 Biases in Individual Decision-making

3.1.2.1 Loss aversion

Loss aversion describes the tendency of individuals to prefer avoiding losses to acquiring gains. In situations where gains outweigh small losses, the desire to avoid those losses may lead to forfeiture of the gains. It is thought that this preference is related to a strong reaction of the affective system, which overpowers the deliberative system (Loewenstein & O'Donoghue 2007). This bias has been shown to be particularly relevant to gambling behaviour. Studies with capuchin monkeys demonstrate that, when introduced to a currency and presented with gambles, the monkeys displayed loss aversion (Chen et al. 2006). Further evidence placing the loss aversion effect within brain structures relating to emotion control was seen in a study by Shiv et al. (Shiv et al. 2005). Responses to a gambling task were compared between three groups: healthy people, patients with brain lesions in centres related to emotional processing and patients with brain lesions in centres unrelated to emotion. Patients with brain lesions in emotional centres displayed less loss aversion by gambling more frequently and also showed less evidence of learning from previous gambles than healthy people and patients with brain lesions unrelated to emotion. This indicates loss aversion was impaired when the affective brain structures associated with emotional control were damaged.

3.1.2.2 Misperception of relative probabilities

A further bias in decision-making arising from the affective system is individuals' misperception of relative probabilities. Evidence for this rests on the theory that an individual's decision-making processes evaluate any perceived risks and assigns relative values to each risk factor. The values assigned however are not always directly proportionate to the actual magnitude of risk. Instead, the risk of rare events is over-weighted and the risk of common events is under-weighted (Loewenstein & O'Donoghue 2007). In the example of the lottery, the large sum offered in potential winnings skews the decision making process with a positive weighting despite the very small odds of winning.

3.1.2.3 Impulsivity

Impulsivity, the 'tendency to act prematurely without foresight' (Dalley, Everitt & Robbins, 2011), is a trait often associated with addiction. Impulsive individuals assign a greater value to short-term rewards over long-term rewards and future gains may be foregone when sacrifices

are required in the present. For example, individuals tend to prefer £100 today rather than £120 in a month's time. This characteristic demonstrates individuals are not simplistically forward-looking and suggests preference is given to the more immediate affective system over the deliberative system (Audrain-McGovern et al. 2009;Loewenstein & O'Donoghue 2007). In several disciplines, this effect is known as delay discounting.

Risky substance use and risky gambling can be seen as examples of strong delay discounting as individuals appear to prefer the immediate gratification of drugs' positive effects over the potential long term health, economic and social benefits of abstinence. Studies of drug users have supported this. Opioid addicts have been shown to discount monetary rewards more heavily than non-drug using controls and also to discount drug rewards more heavily than financial rewards (Madden et al. 1997). Similar behaviours have been observed in cocaine dependents, problem drinkers, cigarette smokers and gamblers demonstrating their impulsive nature and suggesting this may be a behavioural process common to many addictive goods.

3.1.2.4 Role of dopamine receptors in impulsivity

There is emerging neurobiological and genetic evidence to suggest basal neurocircuitry may predetermine an individual's impulsivity. Studies in animals allow manipulations of the dopamine receptor and it's function can give insight into basal neurocircuitry. Studies in rats show that trait impulsivity can predict cocaine use, and impulsivity itself correlated with D2 receptor availability (Dalley, Fryer, Brichard, *et al.*, 2007). Impulsive rats have a low D2/D3 receptor availability and conversely increasing D2 receptor levels using an adenovirus in mice decreased impulsivity (Thanos, Volkow, Freimuth, *et al.*, 2001). Although it is not feasible to manipulate human neurocircuitry as in animal studies, Volkow et al., showed that non-addicted individuals have lower levels of striatal D2/3 receptors, suggesting a deficit in dopamine receptors may influence the liking, and subsequent use of, a drug (Volkow, Wang, Fowler, *et al.*, 1999, 2002).

Genetic polymorphisms may also be important in determining aspects of impulsivity. Single nucleotide polymorphisms (SNPs) are genetic variations in DNA, in which one of the building blocks of DNA (nucleotide) is replaced with an alternative nucleotide. 12 SNPs in four dopamine genes (dopa decarboxylase, dopamine β -hydroxylase, catechol-O-methyltransferase and solute carrier family 6 genes) have been identified which accounted for a 3.9% of variance in sensation-seeking behaviour between individuals. Different dopamine genes appear to mediate different components of impulsivity, suggesting genetic variation may account for some aspects of impulsivity.

3.1.2.5 Imperfect knowledge

Individuals' imperfect knowledge of the potential consequences of their actions is also believed to partially explain deviations from apparently rational decision-making. Individuals often underestimate the health risks associated with substance use and are seen to respond appropriately as knowledge increases. Using data from the US Health & Retirement Survey, Schoenbaum (Schoenbaum 1997) demonstrated that heavy smokers aged 50-62 years overestimated the probability that they would live to 75 by double that of actuarial predictions. Work by Pacula et al. (Pacula et al. 2000) further supported theories of the impact of knowledge on behaviour; finding that as perceptions of drug harm increased in the US, actual drug use decreased concurrently.

3.1.2.6 Short-cuts in decision-making

Individuals use heuristic methods to accelerate the process of decision-making. Thus they may frame decisions in convenient ways which are familiar or easier to comprehend. However, this may lead to errors in judgement, through lack of appreciation of all the necessary facts or options relating to a particular decision (Gilovich et al., 2002)

3.1.2.7 Will power and The Strategic Self

Recent research has argued that will power can be shown to be a resource in limited supply within each of us and that continued use leaves us depleted in reserves for future events. In this way, it is viewed as analogous to a muscle within the body tiring after repeated use (Baumeister et al. 1998; Muraven et al. 1998). It should be noted that this is not an uncontroversial claim, since the notion of will-power is a concept that may only be associated with Western cultures and the Enlightenment rather than humans per se. If correct, it implies that when an individual is required to exert self-control then they have less will power available for subsequent tasks even if the tasks are unrelated (Baumeister, Bratslavsky, Muraven, & Tice 1998; Muraven, Tice, & Baumeister 1998; Tice et al. 2001; Vohs et al. 2008). Reserves can subsequently be replenished by sleep and glucose intake (Gailliot et al. 2007; Gailliot and Baumeister 2007; Muraven et al. 1999). Experiments have suggested that willpower may be trainable, again like a muscle, and thus future use of willpower will not deplete reserves to the same initial extent. One challenging implication of this theory is that as poor people are constantly required to exert willpower in order to live within their means and must forego enticing purchases they cannot afford, they are left with less remaining willpower to resist relatively inexpensive temptations such as cigarettes or alcohol (Loewenstein & O'Donoghue 2007).

In the context of risky engagement with addictive substances and behaviours, this links back to earlier arguments by the likes of Schelling that addictions and addictive behaviours stem from

problems of self-control, and an inability of the individual to reconcile conflicting inner drives (Durlauf and Blume 2008). As a bias on the decision-making system, this suggests the deliberative system must overcome the initial responses of the affective system in order to alter one's responses and not succumb to poor self-control.

Individuals are often aware that they exhibit a lack of willpower in certain situations and of the need to conserve strength in order to exert willpower. For example, one study demonstrated that individuals who were aware that they would be performing multiple tasks requiring willpower appeared to conserve their strength and subsequently achieved improved performance on later tasks than those who were unaware (Loewenstein & O'Donoghue 2007). The deliberative system may be strategically used to avoid loss of self-control in circumstances in which individuals are aware that they possess little willpower. In particular, pre-commitments can be made including choosing friends who do not engage in specific tempting behaviours such as substance use or gambling, limiting available financial resources or by an individual being conscious of and altering the way in which they make decisions pre-emptively (e.g. by altering consumption behaviour before signalled price changes occur) (Cave] and Godfrey 2005;Gruber and Koszegi 2001;Gruber 2002;Gruber and Kæszegi 2004).

3.1.2.8 Summary

In summary, there is evidence that humans make decisions through the interaction of a deliberate system and an affective system. However, the affective system in particular is subject to a range of biases which can lead to decisions which may appear irrational at first glance. This model of decision-making is in line with theories from welfare economics of rational decision-making. The theory of rational addiction draws on this explicitly.

3.1.3 Theory of rational addiction

The theory of rational addiction (Becker and Murphy 1988) is concerned with what motivates and biases the choices an individual makes regarding addictive substances or behaviours. It is based on a central tenet of welfare economics which assumes that an individual's choices are rational and directed towards increasing their well-being (termed utility). At the heart of the theory is the proposition that, although addiction is an irrational process, it emerges from a rational decision that the benefits to well-being from present engagement in addictive substance use or behaviour outweigh the future risk and associated costs to well-being of addiction. The short-term benefits include the pleasurable effects of drugs or the desire to belong to a certain peer group where substance use is common (MacDonald 2004).

The assertion that individuals balance future costs against present benefits implies users of addictive substances are forward thinking and that they trade-off various potential costs and benefits within their decision-making process. However, this is just one aspect of a complicated theory. The full model takes account of concepts such as tolerance (i.e. the more you drank previously, the less satisfying any given level of drinking is now), reinforcement (i.e. the more you drank previously, the more satisfying drinking is now), consumption capital (a composite measure of how previous addictive consumption affects current consumption) and the depreciation of consumption capital over time. Elements of social learning and regret have also been factored into the model (MacDonald 2004). All these considerations make rational addiction a dynamic model which uses past behaviour and temporal processes as influences on current decision-making. As with other rational consumer models, the rational addiction model also accommodates a range of biases on decision-making, which are contrastingly viewed as irrational behaviours, including those described above.

Rational addiction theory has been widely criticised and ridiculed in some cases. Critics suggest the theory is not supported by empirical evidence and states that addicts are often inconsistent in the preferences they are posed to rationally chose (Elster & Skog, 1999). It is not the purpose of this report to assess the fairness of critiques, however, the theory unquestionably has certain redeeming features. Most importantly, it is supported by evidence demonstrating that addictive goods obey the law of demand. That is, when prices rise, consumer demand for a good falls and, conversely, reductions in prices increase demand conversely (Becker & Murphy 1988; MacDonald 2004). This has been demonstrated across numerous addictive goods, including alcohol, tobacco and illicit drugs (Caulkins & Nicosia, 2010; Wagenaar, Salois & Komro, 2009; Chaloupka, Straif & Leon, 2011; Cave & Godfrey, n.d.) and suggests that some elements of rational decision-making are present when electing whether or not to purchase addictive goods. The decision process may not involve individuals consciously conducting complex cost-benefit analyses, indeed few economists would argue it does, however, the process does appear to function as if something resembling this, albeit with numerous short-cuts and biases, is subconsciously occurring when assessing prices. Further evidence also supports the availability of the addictive good, levels of IQ or education and anticipatory responses to future price changes as being part of decision-making processes for purchasing addictive goods (Gruber & Koszegi 2001; Gruber 2002; Gruber & K+æszegi 2004). Therefore, although some, perhaps substantial, elements of decision-making processes around engagement with addictive goods may not conform to economics-driven definitions of rationality; the rational addiction model can contribute important determinants of that engagement (Caulkins and Nicosia 2010; Melburg and Rogeberg 2010). As risky substance use and risky gambling are

less subject to the irrationality of addicted behaviour, there is no reason to think these determinants are not relevant to this report.

3.1.4 Vulnerabilities in the Decision Process

A different understanding of decision-making is present by Redish et al.'s model of vulnerabilities in the decision process (Redish et al. 2008). Within this model, behaviours which lead towards the development of an addiction, such as engaging in risky substance use or risky gambling, can be seen as a series of maladaptive decisions taken by individuals. Redish et al.'s model combines theories from psychology, neurobiology, neuroeconomics, human decision-making and animal learning to produce a unified theory of addiction focusing on decision-making. It states that 1) three different systems interact within the brain in the process of decision-making, 2) that vulnerabilities within these systems, sometimes drug-induced, alter the likelihood of individuals making maladaptive choices which lead to the development of an addiction and 3) that previous theories tend to explain different vulnerabilities rather than giving consideration to the full range of identified vulnerabilities.

The three interacting neurological decision-making systems considered are the planning system, the habit system and the situation recognition system. The planning system is a flexible learning system capable of consideration of actions and potential resulting consequences. The habit system is a more rapidly responding inflexible learning system based on specific associations of actions with resulting outcomes. These two learning systems rely on the third neurological system, a situation recognition system, which categorises observed cues into situations. The planning and habit systems share similarities with the deliberative and affective systems, as described in the dual decision theory. Both the planning and habit systems interact in the process of decision-making to predict the value or expected utility of a decision, with the planning system showing rapid learning but slow retrieval of information, whilst the habit system demonstrates more rapid responses yet is subject to rigidity and cannot easily adapt to new situations. Although the planning system is usually engaged early in decision-making processes, repeated exposure to situations or tasks, such as navigating common routes, leads to control being passed from the planning system to the habit system. The situation recognition system contributes to the prioritising of the planning and habit systems in different situations. In new situations, the planning system is more active but, with repetition, the habit system becomes more prominent. Vulnerabilities in the situation recognition process can lead to inappropriate prioritisation of habit-based responses over planned responses and vice versa.

The full set of vulnerabilities which have been identified as impacting on this decision-making process by the Redish model are detailed in Table 1. Many of these will be familiar from the discussion of biases in decision-making above, however, the Redish et al. model is also able to accommodate recently proposed theories, such as incentive salience and impulsivity, as different vulnerabilities within the decision-process system.

Vulnerability	Description	Key systems	Clinical consequences
1	Moving away from homeostatis	Planning	Withdrawal
2	Changing allostatic set points	Planning	Changed physiological set points, craving
3	Mimicking reward	Planning	Incorrect action-selection, craving
4	Sensitization of motivation	Planning	Incorrect action-selection, craving
5	Increased likelihood of retrieving a specific action in anticipation of a given outcome (S-O) elation	Planning	Obsession
6a	Misclassification of situations: overcategorization	Situation-recognition	Illusion of control, hindsight bias
6b	Misclassification of situations: Overgeneralization	Situation-recognition	Preservation in the face of losses
7	Over-evaluation of actions	Habit	Automated, robotic drug-use
8	Selective inhibition of the planning system	Situation-recognition	Fast development of habit learning
9	Over-fast discounting processes	Planning, habit	Impulsivity
10	Changes in learning rates	Planning, habit	Excess drug-related cue associations

Table 1: Failure modes in the decision-making system provide a taxonomy of vulnerabilities to addiction. Adapted and modified from Redish et al., (2008).

The Redish et al. model recognises both pre-existing vulnerabilities in decision-making and also those induced by engagement with addictive substances and behaviours. For example, euphorogenic effects of addictive substance use will drive repeated use due to the associated reward signals which become associated with use. Although primarily a model of addiction, this accommodation of the processes by which decision-making vulnerabilities develop through initial and repeated use of addictive substances provides insight into how these vulnerabilities

may relate to risky behaviour as well as demonstrating that some of the biases in decision-making described in other decision-making models are broadly accepted.

3.1.5 Synthetic Neurobiological Model of Addiction

The synthetic neurobiological model argues addictions develop by passing through three stages; binge/intoxication, withdrawal/negative affect and preoccupation/anticipation (Le Moal and Koob 2007). The determinants which predict those who progress to the binge/intoxication stage are different to those which predict who progresses to the preoccupation/anticipation stage. In general the former is influenced by social and environmental factors whilst the latter is strongly associated with neuropharmacological and neurobiological factors. The model also highlights that drug users are a highly heterogeneous group with inherent or acquired vulnerabilities such as developmental factors (e.g. adolescent exposure to substance use), temperament and comorbidities.. In line with these inherent or acquired vulnerabilities and the focus on social and environmental determinants, the authors of the model propose that individuals often initiate and escalate risky substance use and risky gambling as a means of coping with stress and life events beyond their control.

3.2 Psycho-social and psychological models

The decision-making models discussed above focus on how the brain makes decisions and how variations in decision-making processes can affect behaviour outcomes. The next set of models move away from decision-making to focus on how the psychological and social characteristics of individuals and their environments interact to influence their engagement with addictive substances and gambling. Much of this evidence is drawn from psychological research as that discipline's methodologies particularly lend themselves to the construction and statistical testing of statistical models to identify factors which influence behaviour directly or in conjunction with other factors.

Four different models are presented; these are the stress-vulnerability model, the theory of problem behaviour, a comparison of adolescent limited and life-course behaviour and a typological model of pathways into problem gambling. A fifth section presents separate evidence on the effects of marketing on risky substance use and risky gambling, with a particular focus on young people as those subject to special attention by marketers.

3.2.1 Stress-vulnerability model

The stress vulnerability model presents the idea that vulnerability to addiction may be either innate or acquired through early life events (Buehringer et al. 2008). In either case, their emergence is temporally distal from the risky behaviour itself. These vulnerabilities are then exposed by stressors which are temporally proximal to the behaviour and may act as triggers for initiation of the risky behaviour. Increasing numbers of stress factors affecting the individual will accumulate the total effect making it more likely that the individual will proceed to risky substance use and at an earlier point. This is particularly the case if their vulnerability level is already high.

The model combines biological, psychological and social determinants which act as vulnerabilities and provide a cumulative risk for substance use onset and development. Within this model, addiction is considered as a continual progression from initiation through to problematic use and eventually dependence. Risky use is not described as an explicit stage but can be argued to be situated between initiation and problematic use.

3.2.1.1 *Innate vulnerability factors*

Innate vulnerability factors include gender, age, psychological dispositions and disorders which do not change with events and genetic profiles. Males are considered to be more vulnerable to risky substance use, with evidence demonstrating increased binge drinking and increased drinking frequency (Buchmann et al. 2009;Kuntsche et al. 2011), a higher frequency of cannabis use (von Sydow et al. 2002), a higher frequency of tobacco use (Korhonen et al. 2009), greater propensity for driving under the influence of drugs or alcohol and increased risk for experiencing accidents whilst driving under the influence (Kelly et al. 2004). Some of these innate vulnerabilities are not straightforward determinants but have interactive relationships with other determinants. For example, the association between externalising disorders such as attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder and conduct disorder and increased early alcohol and cannabis use is significant only for males (Elkins et al. 2007;King et al. 2004). The association between being male and risky substance use has been explored in economic experiments and these suggest that males are more inclined to compete and take risks (Niederle and Vesterlund 2007).

Being young, (defined as under 16 by the majority of studies), is associated with increased risky substance use and potential explanations include the increased sensation seeking associated with adolescence (Dayan et al. 2010), the lack of understanding of consequences associated with their actions (Loewenstein & O'Donoghue 2007) and inability to either appropriately moderate intake or tolerate drugs to high levels without affecting their development (Dayan,

Bernard, Olliac, Mailhes, & Kermarrec 2010). It is worth noting that the latter is less an explanation for why young people are more likely to engage in risky substance use and more an explanation for why such substance use is risky. Numerous studies have shown increased vulnerability to risky substance use with young age for cannabis, driving under the influence of alcohol and smoking during pregnancy (Fergusson et al. 2007; Kelly, Darke, & Ross 2004; Raatikainen et al. 2007; von Sydow, Lieb, Pfister, H+Äfler, & Wittchen 2002). Certain risky behaviours have, however, been found to be associated with older age groups. These include driving under the influence of benzodiazepines (which is associated with middle age), and injecting heroin or cocaine, (which was associated with 25-35 year olds compared to 18-25 year olds) (Kelly, Darke, & Ross 2004; Ropelewski et al. 2011). This evidence suggests these behaviours may be more habitual and are less related to sensation seeking by the individual.

The causes of externalising disorders are not fully understood, but may include biological, neurological and environmental influences; thus they may not be wholly innate. Such disorders are associated with increased impulsivity, inattention, hyperactivity, defiance of authority, irritability and aggression. Many studies have linked externalising disorders to early initiation of substance use and the risky use of drugs, particularly with reference to impulsivity (Audrain-McGovern, Rodriguez, Epstein, Cuevas, Rodgers, & Wileyto 2009; Elkins, McGue, & Iacono 2007; McGue et al. 2001; Sung et al. 2004; Verdejo-Garcia et al. 2008).

Internalising disorders, including depression, anxiety disorder, phobias and panic disorders, are another psychopathology which may arise in individuals and confer an increased vulnerability to substance use. Again, the underlying causes for such disorders are not fully understood, with both biological and environmental factors contributing. Individuals with internalising disorders may seek to avoid the adverse consequences through using the positive effects of addictive substances as a coping mechanism (Buehringer, Wittchen, Gottlebe, Kufeld, & Goschke 2008; Kuntsche, Kuntsche, Knibbe, Simons-Morton, Farhat, Hublet, Bendtsen, Godeau, & Demetrovics 2011). Empirical evidence has supported this and has identified the presence of an internalising disorder as a determinant of addictive substance use (Buehringer, Wittchen, Gottlebe, Kufeld, & Goschke 2008; Harrington et al. 2011; Huizink et al. 2006; King, Iacono, & McGue 2004).

3.2.1.2 Acquired Early Childhood Events

Events in early childhood can have deleterious effects on development and may increase individuals' vulnerability to substance use in the future. Loss of a parent, divorce or parental conflict, neglect, isolation, low initial levels and a slow increase in behavioural control during childhood and being from a single parent family are all factors which are known to increase

vulnerability to substance use (Sinha 2008;Wong et al. 2006). Additionally, environmental factors such as parenting behaviours and being raised in a low income environment can contribute to the onset of externalising and internalising disorders (Bor et al. 1997;Scaramella et al. 2008;Sieh et al. 2010). All of the factors listed here may contribute to the development of negative mood and anxiety disorders in the individual, which can increase their vulnerability to substance use (Sinha 2008). In contrast, authoritative parenting whilst young, close monitoring and strong ties between the child and the parent act as powerful protective factors against the development of substance use or abuse (Koning et al. 2010;Van Der Vorst et al. 2009).

The effects of the above factors can be explained through various mechanisms. For example, the impact of growing up in an impoverished household may arise due to less opportunity the parent having inadequate financial, psychological, temporal or social resources to invest in parenting behaviours. This may prompt feelings of boredom and loneliness in the child which are assuaged by the powerful effects of substance use. Further, lone parenthood may increase stress in the parent and prompt conflict in the parent-child relationship leading to externalising behavioural disorders in the child (Drugli et al. 2010;Mensah and Kiernan 2010). Many of these factors also impact on the child's cognitive development and resultant educational achievement. Poor early educational outcomes may result in later educational disengagement and a consequent lack of understanding of the possible dangers arising from engagement in risky substance use and risky gambling.

Early initiation of substance use is a powerful predictor of future problematic behaviour and therefore a very strong determinant of risky substance use (Breslau et al. 1993;Chen et al. 2005;DeWit et al. 2000;Loth et al. 2011). This substance use at an early age predisposes the individual to later use and thus increases their vulnerability level. The mechanisms by which this occurs are unknown but possible explanations include through learning and enjoyment of the substance, increased ease of access, reduced perception of the associated dangers through previous experience and being surrounded by others consuming the substance or cognitive alterations which bias the individual towards repeated experience.

3.2.1.3 Stressors

Risk factors which are temporally more proximal to the onset of risky substance use expose the pre-determined vulnerabilities of the individual. These factors include stressful life events (e.g. relationship breakdown, criminal victimisation and bereavement), availability of behavioural opportunities, pre-existing use of others addictive substances, early peer substance use and peer pressure, social networks and support, family functioning and environment, coping styles, psychopathologies (e.g. internalising and externalising disorders) and a wide range of impaired

cognitive behavioural and emotional competencies, such as self esteem, self control and coping skills (Buehringer, Wittchen, Gottlebe, Kufeld, & Goschke 2008).

Increased availability of substances is a powerful predictor of risky use. Both increased use and earlier initiation have been linked to increased ease of access of cannabis in adolescents (Hofler et al. 1999; Pedersen et al. 2001). Indeed, increased access to addictive substances and being around peers who consume drugs may also heighten the individual's awareness of such substances.

Peer influence is a strong determinant of risky use and can be understood as wanting to conform and belong to a certain group and so following their behaviour. There is much evidence to demonstrate that when individuals are amongst peers that consume higher levels of a certain substance they themselves are high consumers (Duncan et al. 2005; Larsen et al. 2009). Individual perceptions of normal behaviour may be determined by their peers. If substance use is perceived by the individual as part of normal behaviour, for example during adolescence, they may initiate or increase use. Conversely, it has been argued that conforming to social norms may act as a protective factor. A study by Zucker (Zucker et al. 2008) demonstrated that moderate levels of addictive substance use may contribute to social relationships and success. Zucker's study found that increased social functioning and intelligence were related to a moderate level of alcohol consumption, with problematic behaviour more typically arising in those of lower educational achievement, at greater social disadvantage and with reduced social competencies. Further Zucker et al. have shown that certain addictive behaviours are naturally developmentally-limited and that peer pressure can play a role in the extinguishing of risky behaviours over time. For example, binge drinking college students eventually mature and reduce such behaviours to again maintain the social norm set by their peers (Zucker, Donovan, Masten, Mattson, & Moss 2008).

Concomitant use of different substances increases the potential of the individual to progress to risky use, as they may be exposed on a more regular basis to others involved in and consuming different substances, which may bias their decision-making through altering estimations of the potential danger of various substances and the increased perception that further substance use is a normal behaviour.

More formal social grouping have also been shown to be a strong influence on the individual in preventing the initiation of substance use. Religiosity is one example and support groups such have been shown to be effective by surrounding individuals with others who are experiencing similar situations and can empathise and thus limiting the amount of time spent with previous

peers who were or still are consuming drugs and may negatively influence the individual (Piko and Fitzpatrick 2004;Wallace and Muroff 2002).

In addition to the distal influences of early child family contexts, the proximal family context may influence the individual through increasing stress if conflict exists in the home, or if the individual is being physically or emotionally abused. Parental consumption of drugs has been shown to influence children's behaviour both in increasing the potential for risky substance use, through children's imitation of their parents behaviour, wanting to emulate their parents through increased availability and also through reduced parental control over the child as the parent is under the influence of drugs (Mensah & Kiernan 2010).

Being of low socio-economic status is considered an influential factor on the potentially risky behaviour of individuals. Additionally, low educational achievement may add to the increased potential for risky behaviour in the individual through both lack of understanding of risks as discussed above, and disengagement with society resulting in a will to use or abuse substances to deal with the increased stress of the individual's life circumstances (Buehringer, Wittchen, Gottlebe, Kufeld, & Goschke 2008;Cave.J & Godfrey 2005;Pacula, Grossman, Chaloupka, O'Malley, Johnston, & Farrelly 2000).

Both externalising and internalising disorders can act as stressors in the stress vulnerability model to increase the likelihood of the individual engaging in risky substance use, through isolation and loneliness related to individuals' anti-social behaviour, increased impulsiveness (as discussed above), or as a coping strategy to deal with the effects of the disorder (Buehringer, Wittchen, Gottlebe, Kufeld, & Goschke 2008).

3.2.3.3 Summary

The stress vulnerability model brings together a huge weight of psychological, biological, social and epidemiological evidence into a single model of how a large number of determinants interact to influence the likelihood of individuals engaging in risky substance use and risky gambling. Although precise quantification of the influence of individual factors, identification of the most important factors and ascertaining which factors have a causal relationship with risky behaviour and which are simply indicators of groups where this might occur is challenging, this model does provide an important conceptual understanding of the interaction between determinants associated with a range of scientific disciplines and occurring at multiple points in individuals lives.

3.2.2 Theory of Problem Behaviour

The theory of problem behaviour, as described by Jessor (Jessor and Jessor 1977), is a social-psychological framework that has largely been used with reference to young people. It hypothesises that all behaviour is the result of interactions between characteristics of individuals and characteristics of environment. The likelihood of engaging in a particular problem behaviour, such as risky substance use or risky gambling, is theorised to emerge from the interaction of three systems; the personality system, the perceived environment system and the behaviour system. Each of these systems is composed of a number of factors which either positively or negatively influence the likelihood of engaging in problem behaviour.

The personality system includes individual-level psychological constructs such as values, expectations, beliefs and attitudes and these particularly reflect the social learning and developmental experiences of the individual. Increased likelihood to engage in risky behaviours may arise within the personality system through low academic achievement, higher values of independence, greater social criticism, higher alienation, lower self-esteem, greater attitudinal tolerance of deviance, and lower religiosity.

The perceived environment system is based on the individual's perceptions of societal level constructs; for example, perceived social controls, identification of peer role models and perceived levels of social support. Within this system, certain influences (e.g. peer influences) may be seen as more salient than others (e.g. parental influences).

The behaviour system includes societal-level attributions of different behaviours as problematic or conventional. The latter behaviours are socially approved, normatively expected and codified or institutionalised as appropriate for adolescents. Examples include church attendance and academic study. In contrast, problem behaviours are behaviours which are socially defined as problematic, of concern or undesirable and this may be demonstrated through their eliciting a disapproving response or, at the extreme, incarceration of individuals who engage in the behaviour. Behaviours viewed as problematic may also vary by context and by age of the individual engaging in the behaviour. Examples include alcohol use, cigarette smoking, gambling, recreational drug use and precocious sexual activity. Individuals may be more likely to engage in one problem behaviour if they are already engaging in another (Barnes et al. 2002;Goudriaan et al. 2009;Vitaro et al. 2001;Welte et al. 2009a;Welte et al. 2009b) or where it is perceived that this will confer a status of increased maturity on the individual.

3.2.3 Adolescence Limited and Life-Course Behaviour

Moffitt (1993) has argued that juvenile delinquency, which includes risky substance use and risky gambling and also may lead to this (Cairns and Cairns 1994; Loeber and Dishion 1983; Vitaro et al. 2004), occurs in two distinct groups of individuals. These are a small group whose risky behaviour persists across the life course and a much larger group whose risky behaviour is limited to their adolescence (Moffitt 1993).

Life course persistent delinquency tends to emerge earlier than its adolescence-limited counterpart and it is associated with characteristics such as a difficult temperament, problematic parent-child relationships and academic difficulties. These factors act as inhibitors on individuals' opportunities to learn positive social behaviours (Lynam et al. 1993). As individuals fail to learn conventional social behaviours, they become progressively ensnared in the consequences of their delinquent behaviour, such as dropping out of school and teenage pregnancy, thus limiting the opportunities for them to break free from such negative circumstances (Moffitt 1990).

In contrast, the majority of delinquent behaviour is temporary, emerges later and is short-term. This adolescence-limited behaviour often emerges only in situations where individuals perceive a profitable response (Moffitt 1993), such as proving they are mature and autonomous in front of peers (Kandel 1980). In this respect, the theory of adolescence-limited behaviour is similar to the transition behavioural motivations outlined by Jessor's theory of problem behaviour (Jessor et al. 1991). As adolescents are engaging in the behaviour with profit motives they are able to maintain control over the behaviour. As adolescents age and gain access to some of the privileges coveted in their youth, the cost of risky behaviours such as substance use and gambling is seen as outweighing the benefits and the behaviours gradually cease (Moffitt 1993). Adolescent-limited risky behaviour can thus be seen as subject to reinforcement (e.g. from peers) and punishment (e.g. to future success) considerations. Indeed, the risky substance use and gambling amongst adolescents has been found to decline following leaving school, marrying a spouse or gaining full time employment and this may explain some of the discrepancies in substance use rates between adults and young people (Maggs and Schulenberg 2005).

Moffitt further notes that adolescence-limited delinquents may have greater potential to profit (or at least avoid substantial losses) by taking opportunities to desist in risky behaviours; whereas their life-course persistent counterparts are less likely to be able to realise these gains and do not move away from such lifestyles.

Empirical support for Moffitt's theories can be seen in Vitaro et al. (2004) which identified different trajectories for male adolescent gamblers. These showed that those displaying an

early onset in gambling behaviours had a different more risky pattern of behaviour more in line with life-course persistent characteristics when compared to those entering into it at a later age, which typified the more controlled adolescence-limited behaviour (Vitaro, Wanner, Ladouceur, Brendgen, & Tremblay 2004).

3.2.4 A typological model of pathways into problem gambling.

Many problem gamblers exhibit similar characteristics and these include being male, single and having increased substance use, particularly of alcohol. However, according to Blaszczynski and Nower (2002), there are distinct types of problem gamblers with different pathways into this behaviour.

The first group are described as behaviourally conditioned gamblers. This group are generally introduced to gambling by family members or peers and get caught up with gambling and chasing losses which can lead to anxiety and depression. This group represent the least risky group of gamblers (Blaszczynski and Nower 2002).

The second group are emotionally vulnerable gamblers. They display high levels of depression, anxiety and alcohol dependence. They have pre-existing psychological problems or may be affected by severe adverse life events and thus gamble as a means of escape (Blaszczynski & Nower 2002), as seen in Jacobs theory of addiction (Jacobs 1986) and echoed in the stress-vulnerability model (Buehringer, Wittchen, Gottlebe, Kufeld, & Goschke 2008). The evidence surrounding entry into problem gambling as a form of coping behaviour is unclear. Among at-risk gamblers, there may exist a group that responds more strongly to stress and that experiences higher levels of anxiety and depression, leading to problem and pathological gambling behaviour as a coping strategy for such negative emotionality. Consequently, it would be expected that combinations of stressors would amplify the risk of problem gambling in a synergistic manner; however, no support for this hypothesis was found in a study by Lee et al. (2011). The interaction between depressive symptoms and impulsivity was found to influence problem gambling, but no direct correlation was observed. One potential explanation for this is that the coping pathway leading to risky gambling may be independent from other types of risky gambling (e.g., antisocial impulsive) (Lee et al. 2011) and thus analyses would need to first identify separate types of gamblers into different groups before being able to identify statistically significant relationships between stressors and gambling behaviour.

The final group of problematic gamblers are defined by a neurological or neurochemical dysfunction which manifests as impulsivity. This group has a pre-gambling history of

impulsivity and often display a range of behavioural problems in addition to risky gambling, such as substance use and criminal activity. Within this group gambling behaviour is often initiated at an early age, reflecting the multiple antisocial characteristics identified in Jessor's theory of problem behaviour and Moffitt's life course persistent delinquents (Jessor & Jessor 1977;Moffitt 1993). The suggestion that conduct disorder symptoms and alcohol use generally precede risky gambling onset (Welte, Barnes, Tidwell, & Hoffman 2009a;Welte, Barnes, Tidwell, & Hoffman 2009b;Winters and Anderson 2000) has been corroborated by several other studies (Barnes, Welte, Hoffman, & Dintcheff 2002;Barnes et al. 2005;Goudriaan, Slutske, Krull, & Sher 2009).

3.2.5 Marketing

Marketing within the public space is limited to licit substances and behaviour (i.e. alcohol, tobacco and gambling), although tobacco advertising has been severely curtailed in recent years in line with the increasing negative associations with smoking. A large portion of this marketing is carried out through the traditional media channels; however, more recently online promotion of products has increased. Several studies have demonstrated clear links between marketing and increased consumption of addictive products and engagement in addictive behaviours

The marketing of addictive substances and behaviours such as alcohol and gambling has a key place in attracting new users and increasing consumption of current users and thus influencing their engagement in risky behaviours. Studies have demonstrated that a large portion of such marketing activity is targeted at youth (Gardiner and Clark 2010;Hong et al. 2011;Monaghan and Derevensky 2008), in order to increase uptake and gain brand loyalty ensuring a long term customer base. Several examples of how marketing techniques are used to attract particularly young people are provided below.

Alcohol manufactures developed alcopops, which are marketed in a specific manner to appeal to a younger drinker. The sweetened taste of such drinks, along with their package design, product image and marketing strategies are all designed to appeal to youngsters and attract new drinkers (Barbor et al. 2010;Gunter et al. 2010;Metzner and Kraus 2008;Smith and Foxcroft 2009). Promotion of these products has been linked to increased consumption with the young being most susceptible to such marketing strategies (Gunter, Hanson, & Touri 2010;Smith & Foxcroft 2009). Further, price promotions on alcohol are often thought to exert their greatest influence over underage drinkers, who have less available money, and have been linked to increased binge drinking which increases the associated risks of drinking (Booth et al. 2008). Alcohol brand recognition has also been shown to affect youth and many companies achieve this

status through strategies such as sports sponsorship and celebrity endorsement (Monaghan & Derevensky 2008); indeed, adolescents who expressed liking certain adverts for alcohol products were seen to also have to consume more alcohol and to drink more frequently (Nelson 2011;Smith & Foxcroft 2009).

The tobacco industry targets youth to increase new smokers through strategies such as menthol flavoured cigarettes, and 'mild' or 'light' tobacco brand varieties. Many youths and adults believe these pose lower health risks and result in less possibility of addiction and they thus allow an easier initiation and reinforcement of nicotine addiction (Gardiner & Clark 2010;Hammond 2010).

Within the gambling industry survey research has shown that 40% of adolescents participated in gambling activities because their friends were involved with similar practices (Hardoon and Derevensky 2001). New technologies, particularly in the online gambling arena, where easier access is linked to increased uptake (McMullan 2011;Per Binde 2009), facilitate peer approval and foster a culture of familiarity and friendship with greater rewards for return customers and encouragement to recommend the site to others (Monaghan & Derevensky 2008). Many online gambling sites also feature practice sites, which offer the experience of online gambling without a monetary commitment. This is of particular concern in relation to youth as these experiences popularise online gambling and often offer increased rewards relative to money sites, whilst removing initial barriers to engaging in such risky behaviours including having access to a credit card (Griffiths and Parke 2004;King et al. 2010;Monaghan & Derevensky 2008;S+@vigny et al. 2005).

Illicit drugs, by their nature, cannot be publicly marketed. However, word of mouth, peer pressure and the risky reputation associated with such substances act as a form of marketing. Further the appearance and portrayal of illicit substances in popular culture as both fun and fashionable adds to the image of such substances.

3.3 Influences on risky behaviour within population subgroups

So far this report has addressed models of influences on risky substance use and risky gambling which focus on the individual, their characteristics and the decision-making processes. However, individuals do not live their lives in isolation and their interactions with society and the societal interactions that take place without their participation have also been seen to shape risky behaviour.

One aspect of these societal processes are how population groupings, whether they be marginalised groups, youth subcultures, gender groups or society as a whole, lead individuals to interact and jointly develop particular perspectives and practises relating to addictive substances and behaviours. The following sections discuss the processes by which these perspectives and practises emerge and evolve drawing particularly on evidence from sociological and anthropological studies.

3.3.1 Social and Economic Marginalisation

Many anthropological studies relate their findings to themes which fall under the umbrella of social and economic marginalisation, such as power and class inequality, deprivation, poverty and social exclusion. The latter refers to the relative exclusion of individuals and groups from goods, services and facilities depending upon their circumstances. Such divisions in society are frequently associated with factors such as economic status, ethnicity, the class system, educational status, relationships in childhood and living standards. Engagement in risky substance use and risky gambling is often seen to occur along similar societal lines and this is discussed further below.

Substance use or gambling behaviours are often seen as developing as a result of the poor material conditions of the individuals or groups studied. Such poor conditions include a lack of resources including money, education and housing, unemployment and low social status within society. These conditions are argued to increase the likelihood of engagement in risky behaviours as either a coping mechanism for dealing with or escaping from the challenges of marginalisation or as an alternative means of developing status within social networks which operate on non-mainstream values (Bourgois 2003; Drumm et al. 2005; Pearson 1996). Neurobiological studies have shown that social status, and the level of dominance within a social group, may predispose to drug use. Individually housed monkeys do not display any differences in drug use, however this is modified when monkeys are socially housed within a group and form a hierarchy. Nader showed that subordinate monkeys in a group were more likely to self-administer cocaine and had reduced D2 receptor availability, whilst the dominant monkeys who had a higher level of dopamine receptors self-administered a lower level of cocaine. Studies such as these indicate the social environment of an individual, which can be manipulated by many external factors, can determine biological changes which have important behavioural consequences for risky behaviours. Factors such as employment, the housing market, class and power structures and ethnicity will be discussed in turn.

Unemployment is, unsurprisingly, associated with lower disposable incomes and is thus thought to reduce spending on drugs and gambling. Indeed this is commonly seen in those initially made unemployed and amongst the short term unemployed (Schmidt et al. 2002). However, long term unemployment is associated with a more risky patterns of behaviour (Pearson 1996), possibly due to a lack of valued commitments within unemployed individuals' lives, and a lack of drive to maintain previous lifestyles or health status. Zinberg (1984) noted that individuals engaging in substance use in a controlled manner maintained such control in order to support other valued life commitments such as employment. Such maintenance is incompatible with more risky levels or patterns of substance use and so tends to disintegrate when these forms of use dominate (Zinberg 1986).

A second area impacting on marginalisation and risky substance use is the housing market (Curtis 1998;Pearson 1996). Those in society with the most urgent housing needs (e.g. single parents, the homeless, the unemployed and drug addicts) often come to be housed together within estates, which gain reputations of notoriety as problematic areas. These housing structures can act as fertile grounds for the development of local epidemics of substance use problems. The close proximity of significant numbers of drug addicts means drug availability becomes locally concentrated, and use may spread beyond the existing addicted population to new users through the social networks of an estate (Pearson 1996). These environments often lack local amenities and facilities, thus boredom and deprived living conditions become factors which increase the likelihood of risky behaviours as an alternative source of entertainment and solace.

Powerlessness and class have been linked to risky behaviours such as substance use and gambling by anthropologists and sociologists (Bourgois 2003;SINGER et al. 2006). Inequalities stemming from education or class often result in the marginalised seeking alternative forms of status within their social grouping through fighting, criminal acts or excessive substance use and this has been found to be particularly applicable to young men (Bourgois 2003;Pearson 1996). Additionally marginalised individuals may engage in risky behaviours such as substance use or gambling as a coping strategy, with the behaviours helping to alleviate both the psychological distress associated with social marginalisation and also offering a form of escapism. Epele's study of the use of psychotropic drugs in an Argentinean shantytown demonstrates a dramatic increase in the use of psychotropic pills during the economic crisis of 2001-03 as residents were found to be seeking to cope with the stress resulting from societal changes (Epele 2010). Similarly in Russia alcohol consumption was seen to increase dramatically following the collapse of communism, as individuals struggled to cope with the new political reform (McKee 1999).

Various ethnic minorities often suffer social and economic marginalisation which has been associated with risky behaviours (Bourgois 2003;Goncalves de Moura et al. 2010;Pope et al. 2010;Quintero et al. 2007;Windsor et al. 2008); although different substances have been linked with different ethnic groups (Adrian 2002). For example, homeless heroin users in San Francisco were seen to demonstrate different injecting patterns dependent on their ethnicity. Amongst users having difficulties locating a suitable vein for injection, it was noted that white users administered the injection into either fat or muscular tissues, resulting in a vulnerability to abscesses, whereas African American users continued to attempt to locate a vein, despite taking longer and often leaving them with multiple open puncture wounds dripping with blood, increasing their risk of blood borne diseases such as hepatitis and HIV. The authors of this study argue that the reasons for this variation in injecting habits derive from years of specific practices such as body posture, scarring patterns, disease infection rates, polydrug consumption, drug administration, interpersonal relations and family structures resulting in different methods by which the two groups practice their behaviours (Bourgois and Schonberg 2007). Many other studies have noted variations in substance use and gambling prevalence and patterns associated with different ethnic groups, such as increased substance use in Hispanics and white college students compared to Asian and African American students (Goudriaan et al. 2004) and increased gambling in those of white ethnic backgrounds compared to others (Hurt et al. 2008). However, these studies are often small in scale and controversial within the field (Barnes, Welte, Hoffman, & Dintcheff 2002;Barnes, Welte, Hoffman, & Dintcheff 2005;Lee, Storr, Ialongo, & Martins 2011;Welte, Barnes, Tidwell, & Hoffman 2009b). It is also unclear how well such results transfer across national border as much of this research is of North American origin and may not be applicable to European contexts.

The above discussion highlights the many influences upon individuals or groups suffering social and economic marginalisation which may increase risky substance use or risky gambling. It is worth noting as a final point that individuals who engage in such activities may suffer further stigma and marginalisation merely as a consequence of such behaviours, which are often viewed in society as morally wrong (Room 2005) and are subject to sanction, criminal or otherwise.

3.2.2 Youth, leisure and subculture

Substance use is often regarded as contributing to youth identity or being an element which binds subcultures together. Consequently it may arise through peer pressure within friendship groups, the perception that substance use in certain settings or within certain age groups is

normal (e.g. when nightclubbing) or the desire to belong to and feel accepted by a specific subculture identified by its engagement in substance use alongside other features such as music, fashion and specific behaviours.

Subcultures have been described as forms of social networks that prescribe norms governing the conduct of group members (Becker 1993; Becker 1997; Gourley 2004). Members of subcultures may adopt risky behaviours such as substance use and gambling as such behaviours are perceived as culturally accommodated within their subculture. Repeated exposure to behaviours further increases the individuals' perception of the subculture's norms relating to substance use and gambling whilst simultaneously increasing access to drug taking and gambling opportunities. One demonstration of these processes is Gourley's research on ecstasy users in Australia (2004) (Gourley 2004), where he describes how the behaviour of a group of young people is altered over time as their perception of ecstasy changes with their increased use of the drug from very dangerous to normal. This change is associated with ongoing exposure to the substance at raves, during social events and through daily involvements with ecstasy using peers, who provide advice on how to use the drug and prevent problems whilst doing so. This group of ecstasy users is described as constituting a subculture through their shared collection of ideals, values and beliefs surrounding the ecstasy use.

Through involvement with the ecstasy-taking subculture, Gourley's research demonstrates that this group of individuals underwent a specific learning process concerned how to take the drug both for pleasure and also safely (Gourley 2004). Specific learning processes have been implied as essential to the enjoyment derived from risky behaviours, without which the acts may be meaningless to the individual (Becker 1993; Zinberg 1986). Becker states that to smoke marijuana for pleasure requires a ritualised learning process, whereby the individual must first understand the correct way in which to smoke the substance in order to feel the effects, followed by the ability to recognise the effects of the drug before finally enjoying the sensations of drug use (Becker 1993). Zinberg also refers to drug use as a conditioned experience of the individual which is highly reliant upon the setting surrounding the occasion of drug taking (Zinberg 1986).

Despite the common understanding of risky behaviour in youth through the concept of subcultures,, many now argue that there are no longer any clearly differentiated subcultures or youth cultural styles due to the individualisation of music, fashion and society (Redhead 1997). Studies by both Parker (1998) and Measham (2001) demonstrate that the use of drugs, particularly within the clubbing scene in the UK, have entered mainstream youth culture to such an extent that it can be seen as 'normal' and recreational (Measham et al. 2001; Parker et al.

1998) and that these drugs are taken in a controlled manner rather than as deviant behaviour (Parker 2005). Parker establishes a normalisation theory, stating that drug use amongst youth is normal behaviour and those within this age bracket that have not sampled drugs are in the minority, and are therefore deviant. The five dimensions important for the process of normalisation of drug use are: increased availability and access, increased drug sampling rates, increased drug usage rates, the development of accommodating attitudes to drug taking outside of subcultural groupings and cultural accommodation of drug use (Parker et al. 2002). This theory has been criticised for not differentiating between different drugs and different users (Shildrick 2002), yet may explain the reasons for increased substance use in youth and specific settings such as the club scene.

According to Parker (2005), young people's own explanations for their increased substance use point to increased societal pressures placed upon them through both the education and labour systems (Parker 2005) and identify their intoxication as a form of escapism from the pressures of daily life. A further study by Jarvinen and Rahn (2011) examining young Danish people's perceptions of their own substance use uncovered various dimensions perceived to mark the shift from controlled to risky substance use. These included the change from 'intoxication as a means to achieve other things' to 'intoxication as a goal in itself', demonstrating the risk associated with this form of escapism as a tipping point between recreational and risky use (Jarvinen and Ravn 2011).

3.2.3 Gender and sex

Gender has been largely ignored in studies of risky behaviour (Ettorre 2004). Both substance use and gambling are regarded as primarily male activities and this has been supported by epidemiological evidence (Barnes, Welte, Hoffman, & Dintcheff 2002; Haroon & Derevensky 2001; Lee, Storr, Ialongo, & Martins 2011; Measham 2002; Welte, Barnes, Tidwell, & Hoffman 2009a; Winters & Anderson 2000); however, over recent years, the number of females engaging in such behaviours has risen dramatically and the gap between proportions of male and female users is decreasing (Measham 2002). Despite this increase in risky behaviour in females, it has been argued that, men and women are exposed to different structural positions in society and thus engage with addictive substances and gamble in different manners (Ettorre 2004; Measham 2002).

Female substance users are often viewed or portrayed as oppressed, marginalised and victimised by male counterparts. These perceptions arise through the roles that women assume as substance users, specifically; trading sex for drugs, experiencing financial exploitation by

men as women are seen to have easier access to the benefit system and also being exposed to male violence. A study by Windsor et al (2008) examining impoverished black female drug users from New York outlined eight different settings in which these women experienced oppression, including the school system, employment, the correction system, the welfare system, within their relationships with men, the housing system, within their family and in their experiences with drugs (Windsor, Benoit, & Dunlap 2008). It was observed by these authors that oppression is embedded within the rules which govern these different systems and thus women find it difficult to escape them (Windsor, Benoit, & Dunlap 2008).

More recent anthropological research into the role of gender in risky substance using behaviours is beginning to refine these perceptions of females as oppressed and victimised (Epele 2010; Rajah 2010). Draus and Carlson (2009) in their study of crack cocaine using men and women question the assumption that men use their access to the drug and women's dependence on the drug to exploit them sexually (Draus and Carlson 2009). The crack cocaine economy is stratified by gender, giving men increased access to the drug and heightening the subjugation of women. However, interviews with men and women involved in the field show that the relationship dynamics are often far more complex than assumed. Although men found low doses of crack sexually stimulating, this is not the case for higher doses or in any dose for women. Thus women used different strategies to avoid unwanted sexual relationships. These included convincing men to take too much of a drug, thus rendering them unable to perform or, alternatively, obtaining money for drugs by having regular sex with men from different social networks and hence avoiding dependency on crack dealers and often violent relationships with men in their drug networks. These women were noted as viewing sex-for-crack relationships as undesirable and non-obligatory, although occasionally unavoidable. The authors viewed the different dimensions operating within these communications as not strictly oppressing and victimising women. Instead they interpreted the situation as complex power relations and control processes between men and women. This example highlights the role that the structural and cultural relationships surrounding the concept of gender can play in the development of risky behaviours, particularly for women (Draus & Carlson 2009).

In a different area of this theme, lesbian, gay, bisexual and transgender individuals demonstrate specific patterns of risky behaviour, particularly in relation to substance use, which vary from other groups. Within significant sections of these communities, the use of drugs is accepted, and to some extent expected, and this results in relatively high levels of individual risky behaviour (Fazio et al. 2011; Isaiah Green and Halkitis 2006). Isaiah Green and Halkitis (2006) identified a preconception amongst gay men that the use of methamphetamine allows for sexual arousal on demand and the associated ability to derive pleasure from impersonal and multiple sexual

encounters (Isaiah Green & Halkitis 2006). However, it was noted that many first time users of the drug failed to experience the expected aphrodisiacal effects (Isaiah Green & Halkitis 2006), demonstrating the aforementioned subcultural learning processes at play in the use of such substances (Becker 1993). The same study also highlighted the risky sexual behaviours of multiple impersonal couplings and the increased potential for disease transmission within this community as a result of this drug practices (Isaiah Green & Halkitis 2006). Methamphetamine prevention campaigns which targeted the gay community within the US have resulted in a shift from methamphetamine usage towards the use of cocaine, which holds a similar status and role to that played by methamphetamine (Fazio, Hunt, & Moloney 2011). This demonstrates, firstly, that risky drug use is not related to the drug per se, but is often context dependent and, secondly, that prevention strategies may have unexpected and inadvertent consequences where subcultural processes are not fully understood.

3.2.4 The Collectivity of Risky Behaviours

Numerous societal influences and norms penetrate to the level of the individual, small groups and sub-cultures, serving to moderate their behaviour and allow for social stability through integrating individuals into groups, which impose further norms and controls. From the initiation of risky behaviours such as substance use and alcohol to the process of stopping such behaviours much activity is influenced by social norms and expectations.

Each society makes judgements about appropriate ages of initiation into behaviours such as substance use and gambling and these are not always consistent with the age limits prescribed by laws. Such judgements influence the actions of adolescents and may encourage their initiation into risky behaviours to either keep up with age-associated expectations or to increase their peers perception of them as mature through actions which are socially accepted for an older age group (Jessor & Jessor 1977;Paglia and Room 1998). Further there are shared expectations within societies regarding the age at which indulgence in risky behaviours should be begin to be limited again. This is often seen as a process of maturation, where heavy drinking, substance use and risky behaviours such as gambling are naturally curbed in young adulthood in order to fit in with new expectations and responsibilities, such as developing careers, solidifying personal relationships and starting families, as emphasised in Moffitt's theory of adolescent limited behaviour (Hilton 1987;Moffitt 1993).

However, societal influences do not only affect young people's behaviour. Skog's theory of collectivity in relation to drinking and drug-taking asserts there is a strong collective component in risky behaviours surrounding both use and patterns of use. Tendencies of

increased or decreased consumption within a population are reflected at the individual and group level, by their personal use altering proportionately to the rest of society as changes in behaviour filter through the complex social networks which makeup society (Room 1975; Skog 1985). Such social norms surrounding substance use and gambling enforce society's stability, through shared predictability and patterning in everyday life. This promotes the cohesion of individuals into various groups which are further governed by social customs, rituals, ceremonies and norms, creating conformity that allows people to become socialised to the culture in which they live (Weick 1995).

In addition to the role of such collective attitudes and beliefs in maintaining social harmony and structures, societal norms may also act to directly increase an individual's consumption of alcohol or drugs. For example, the custom of toasting with alcoholic drinks is common in many cultures and used as an expression of goodwill in occasions of celebration or commiseration, from the wedding or funeral toast to toasting in the New Year. Such practices encourage increased levels of drinking to maintain pace with the group and display compassion. Moreover, communal celebrations such as fiestas promote increased drinking, with the perception that intoxication is a major feature of such occasions. Individuals are thus encouraged to increase consumption as a marker of their participation and enjoyment (Room et al. 2002).

Despite maintaining a social fabric through the cohesion of individuals, the culture of norms and expectations surrounding risky behaviours can often prove detrimental. These social expectations can be experienced as oppression and individuals wishing to break away from them may find it very difficult. Men of Latin America most commonly escape such reciprocity expectations surrounding drinking cultures, by joining the Pentecostal church, which is committed to abstinence from alcohol, leaving increased resources available to their family (Eber 2001).

3.4 Societal framings and frameworks for risky behaviours

The final set of models describing influences on risky substance use and risky gambling addresses two points. Firstly, how society's make decisions about behaviours which are risky and the impact of those decisions and, secondly, how decisions made by powerful societal actors can determine whether behaviours are more or less risky. Drawing again on anthropological and sociological theory and evidence, the influences discussed below are shown to be key drivers of how society's think about addictive substances and behaviours. Also drawing on theories of public policy interventions, it is shown that societies can make positive choices

which fundamentally shift both the level and nature of risk associated with the behaviours in question.

3.4.1 Deviance and Normalisation

Within society concepts of both normal and deviant behaviour are prescribed, standardised and enforced by formal organisations such as the church, the state, industry and civil society. Legal limits on substance use and gambling and its level of accessibility are defined by government agencies. Meanwhile, organisations like the church impose moral strictures upon risky behaviours, often condemning them as deviant. In contrast, the alcohol, gambling and, in earlier times, tobacco industries endorse and glamorise engagement with their products and promote the idea that these activities are part of normal society and oppose the view of deviance. Hence, all these bodies are termed ‘agents of social control’ (Becker 1997) due to the manner in which they create and influence the concepts of normal versus risky behaviour.

Further influences on the perception of risky behaviours come from societal institutions, such as bars and casinos, which shape the experience of the risky behaviour for the user, and provide a formal context for risky use, partially legitimising such behaviours. Again these influences are regulated by the set limits imposed by the state, the legality of these behaviours and the manner in which they are enforced by policing, and organisations such as civil society which may frown upon risky behaviours. Thus the concepts of normalisation and deviance are central to the sociological analysis of risky behaviours.

What is construed as normal behaviour within society is defined by how others within the same social group perceive a particular behaviour (Matza and Blomberg 2010). Further, adverse consequences resulting from behaviours such as substance use and gambling often define retrospectively whether behaviour is viewed as exceedingly risky. Regular heavy drinking to the point of intoxication may be seen as part of everyday life for a student group, but as unacceptably risky in a person of middle age with a career and family to support. Consequently, the concepts of normal behaviour and deviance, as actions that violate social norms, are situationally defined by the observer.

Those who engage in risky behaviour can adopt a deviant self-identity through societal influences. Lemert (1967) conceptualised the process an individual adopting identities through the processes of primary and secondary deviance (Lemert 1967). Primary deviance is the initial behaviour which is socially condemned. This behaviour may be punished either formally through the legal system or informally through vigilante action or ostracism from the social

group. Thus individuals engaging in such risky behaviours are often pushed together and form a contraculture embedding their deviant identity. Individuals within this contraculture may then internalise the concept of a deviant identity, integrating this with their own self-identity (Lemert 1967). This increases the potential for further risky behaviour in the individual, through their peer associations and self-image.

The concept of normalisation acts as an opposing process to that of deviant identity formation. Developed through analysis of drug taking within the UK dance scene, this theory describes the process whereby behaviours previously seen as deviant, such as taking drugs, become increasingly common in the population and are thus redefined as non-deviant (Parker, Williams, & Aldridge 2002). This process was described in more detail above as a youth subculture.

Whether a particular behaviour is considered normal, deviant or 'risky' is associated with the social statuses the user holds, such as their social class and history (Knupfer 1984; Knupfer and Room 1964). For instance, drinking alcohol is considered normal behaviour for adults, unless suffering medical problems such as mental illness or they belong to social groups dependent on state support, where such behaviour is frowned upon (Knupfer & Room 1964). For people who have previously suffered with addiction, any engagement in the behaviour upon which they were dependent is seen as risky, and is the cornerstone of the theory behind institutions such as alcoholics and gamblers anonymous (Babor and Boca 2002).

3.4.2 Societal framings of risky substance use and risky gambling

The concept of risk in relation to substance use and gambling alters over time in line with changes in society (Conrad and Schneider 1992). For example, the prohibition of alcohol in many countries in the 1920's was borne out of the belief that any use at all could lead to addiction (Levine 1978). Similarly, the international prohibition regime on controlled drugs resulting from the 1961 treaty of the Single Convention on Narcotic Drugs cites the possibility of usage leading to addiction as the primary justification for the prohibitory approach (Room 2006). In these cases the risk posed by any substance use is seen as so great as to prevent all use.

More recently the concept of addiction has been used to distinguish between those who can and cannot handle their usage, creating two populations, for instance recreational and problem gamblers or 'normal' users and those driven by an unknown factor, be it genetic or socialised. This is the framing of addiction which allowed the alcoholism movement in the US to collaborate with the industry and obtain funding for treatment centres in the 1940's and 1950's.

In present day society it is this rationalisation which permits governments to allow the heavy promotion of gambling, from which they derive revenue, without the blame for any consequent problems (Cosgrave 2010). Similarly, the notion of the controlled drinking of alcohol being applicable to the majority allows the unlimited promotion of alcohol with the blame for any resulting problems lying squarely with the drinker (Room 2011). Within this framing, factors such as product availability or promotion are assumed not to affect the development of addictive behaviours, which are inherent to the individual, and as addiction is categorised as abnormal behaviour, non-addicted use is redefined as use without such risks.

Substance use has links with power relations both at the international and societal level. Between the 1400s and mid-20th century psychoactive substances played a key role in European imperial and colonial expansion. Power was obtained by the creation of markets in substances such as opium in Asia and spirits within African colonies, where the resulting revenue was used to run the empires and the subject populations were exploited as labour sources (Brook and Wakabayashi 2000;Crush and Ambler 1992). Historically access to psychoactive substances was the prerogative of the most powerful within societies; this is reflected in the modern day as males engage in more risky behaviour in terms of substance use and gambling than females in all societies (Barnes, Welte, Hoffman, & Dintcheff 2002;Hardoon & Derevensky 2001;Lee, Storr, Ialongo, & Martins 2011;Marshall 1979;Measham 2002;Welte, Barnes, Tidwell, & Hoffman 2009a;Winters & Anderson 2000). However, as the power balance between men and women is readdressed in high-income societies, there has been a convergence of such behaviours, with women seen to show increasing levels of such risky behaviours (outlined in the above section on Gender & Sex; 147).

3.4.3 Harm minimisation policies and approaches to reduce risky use

The riskiness of engagement in addictive substance use and gambling can be reduced through public policies which seek to minimise the harm associated with such activities. Typically referred to as harm minimisation policies, advocates of such approaches often adopt the position that, on conjunction with efforts to reduce risky behaviour, the factors which make the behaviour risky should also be identified and policies enacted which limit that risk.

Perhaps the most well-known example of a harm minimisation policy is provision of needle exchanges or supervised injection sites for injecting drug users. The potentially risky use of substances can be related to mode of administration. Injecting drugs, such as heroin or cocaine, poses greater risks through the use of unclean needles, leading to local infections which can progress to abscesses and a greater potential for transmission of diseases such as syphilis,

malaria, Hepatitis B and C and HIV (Strang et al. 1998). In addition, increased risk of non-fatal overdose is associated with injecting drug users compared to ingesting drugs (Brugal et al. 2002). Further an increased risk of loss of limbs due to intra-arterial infections or thrombotic complications exists in injecting drug users (Strang, Bearn, Farrell, Finch, Gossop, Griffiths, Marsden, & Wolff 1998). Indeed, injecting drug use in itself qualifies as 'problem drug use' according to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) definition (EMCDDA 2012).

The provision of clean needles to limit needle sharing and educating users in correct injecting practices are important methods for minimising such risks (Burris et al. 2004; Hunt and Barker 2001), though require adequate laws and policies putting in place the required health services such as needle exchanges and safe injecting rooms for users (Burris, Blankenship, Donogoe, Sherman, Vernick, Case, Lazzarini, & Koester 2004; Campbell and Shaw 2008). Burris (2004) demonstrates this clearly in an example of increased risky behaviour of injecting drug users in a US city with no needle exchange programme compared to a city which offers such a service (Burris, Blankenship, Donogoe, Sherman, Vernick, Case, Lazzarini, & Koester 2004). Needle exchanges may be insufficient in reducing risk if the necessary equipment, such as bleach or clean water is not included as part of the package available to drug users, causing them to use dirty water and again increasing infection risk. Thus health problems associated with drug use may arise not through the drug use itself, but through the lack of implementation of harm minimisation laws and policies providing services users, which can impact on the possibility of users taking drugs in less or non-risky ways (Bourgois et al. 1997; Burris, Blankenship, Donogoe, Sherman, Vernick, Case, Lazzarini, & Koester 2004; Campbell & Shaw 2008).

The setting in which risky behaviours occur may affect the associated risk. Often substance users engage in substance using behaviours as part of a group, in bars or clubs and, as mentioned above, within safe injecting rooms. Making such environments less risky by, for example, altering bars to use plastic glasses, improve security staff training, design layouts in ways which do not promote violence and minimising practices which encourage drinking to intoxication, can greatly reduce the risk associated with behaviours (Graham, Bernards, Osgood, *et al.*, 2006). However, whilst in some cases group behaviour can increase risk, it can also be protective. Further to the social influence and bonding experience of sharing drug use, many drug users have been noted as taking drugs in groups as a conscious decision to minimise risk, as there are others around who can help should any negative consequences arise (Plant and Plant 1992; S+©rensen et al. 2009).

Beyond harm minimisation by authorities and licit addictive goods industries, studies show that many users are not merely passive agents influenced by drugs. Rather they adopt self-care strategies (Drumm, McBride, Metsch, Neufeld, & Sawatsky 2005; Preble and Casey 1969) which can help to reduce the risks associated with their behaviour. These include, as one study of chronic drug users in Miami identified, improving nutrition, increasing physical exercise, reducing sexual risks, addressing medical concerns and regulating substance use, even whilst continuing to engage in active drug use (Drumm, McBride, Metsch, Neufeld, & Sawatsky 2005).

Increased risky behaviour of substance users is associated with increased overall economic health costs, through the use of both emergency and non-emergency healthcare services by users. Harm minimisation strategies thus offer an opportunity for increased health for substance users but also an incentive for governments seeking to reduce costs by reducing the overall economic burden on the healthcare services for society in general.

3.5 Determinants identified

From the disciplinary reviews, and the above synthesis of their findings, a list of determinants of risky substance use and risky behaviour was extracted. These are presented in Table 2 with determinants seen in multiple disciplines presented first (in bold), followed by other determinants.

Table 2: Key determinants for risky use categorised by discipline. Highlighted determinants identify common determinants between disciplines.

Anthropology	Economics	Genetics	Neurobiology	Psychology	Sociology
Socioeconomic marginalisation	Low socioeconomic status		Low socioeconomic status	Low socioeconomic status	
	Impulsivity	Impulsivity	Impulsivity	Impulsivity	
	Education level			Education level	
Ethnicity					Ethnicity
Availability	Availability			Availability	Availability
Youth	Youth				Age or life stage
Gender				Gender	Gender
Unemployment	Unemployment			Unemployment	Unemployment
Drug usage rates				Drug usage rates	
	Peer influences			Peer influence	
Deprivation	Tax increases		Baseline (innate) alterations in neurocircuitry	Substance use patterns	Normative behaviours
Poor housing or 'sink estates'	Pricing structures		Baseline reduction in brain dopamine receptor availability.	Polysubstance use	Culture/subculture teaches how to use, how to interpret use (and non-use)
Powerlessness and power relations	Delay discounting		Position within social hierarchy	Risky route of administration	Marginilisation
Oppression embedded within governing systems e.g. school, welfare, correctional institution,	Risk awareness		Low cerebral spinal fluid (CSF) levels of the serotonin	Alternative injecting substance use	Less risky if integrated with other activities

employment		metabolite	5-		
		hydroxyindoleacetic (5-HIAA)			
Financial of women exploitation by men	Environmental cues	Serotonin transporter availability		Urbanity of residence	Maintenance of existing cultures or subcultures
Sex workers	Cue reactivity	Reduction in pituitary β -endorphin levels		Recent homelessness (females)	Cultural revitalization movements can reduce use
Mainstream accommodation of drug use	cultural Tolerance			Pregnancy- risky situation	Industry and government economic incentives to increase use
Goal of substance use activity	Reinforcement			Single/ unmarried status	Historical trade and government revenue incentives
Social network structures: sizes and openness				Genotype- 5-HTTLPR	Advertising/promotion pushes up use
Drug buying rates				Family history of drug use	Macroeconomic conditions
				Parental use	Industrialization/commodification/commercialisation pushes up use
				Childhood trauma (including sexual abuse or homelessness)	Prerogative of powerful, denial of substance use to subordinate statuses
				Childhood IQ	Moral/religious sanction
				Childhood disadvantage or socioeconomic stress	Societal reactions to use (often delayed) can push down use
				Poor or low parental monitoring	Societal institutions influence what is defined as risky or deviant

	Familial conflict	Legal controls can influence choice of substance
	Disinhibition/ fun expectations	Prohibition diminishes state control over the market and alters riskiness of behaviours
	Coping strategies	Harm minimisation policies
	Risk taking	User involvement in market activity
	Sensation seeking	Substance use and intimate domination
	High aggression	
	Low behavioural inhibition	
	Inattentiveness	
	Negative emotionality	
	Low constraint	
	Externalising disorders (particularly in childhood)	
	Internalising disorders	
	Truancy	

4. DISCUSSION

4.1 Summary of major findings

In reframing addiction, ALICE-RAP aims to expand policy debate beyond a reductionist approach of focusing solely on addiction itself and, instead, facilitate discussion of broader aspects of addictive substance use and addictive behaviours. Addiction as a clinically defined disorder does not develop „overnight“, but can be characterized as a developmental process with critical thresholds from low risk to risky and harmful use (including, but not limited to addiction as a mental disease). These processes are highly individual concerning duration, pattern and problem severity. A better understanding of individual and social risk and protective factors which modulate these developments is needed to improve public policy, prevention and early intervention. The notions of risk and risky behaviour are novel areas which have not been extensively probed in previous addiction science literature, and, as such, a primary aim of this report was to examine current evidence on the determinants of risky substance use and risky gambling and how the current theory and empirical evidence on addiction may be interpreted in terms of risky behaviour. In doing so, this report also aimed to collate the evidence across several disciplines regarding risky use of psychotropic substances and risky gambling.

One of the most important findings is simply that, in contrast to addiction, risky substance use and risky gambling is an under-researched area. The commentary in this report goes beyond the rigid structure of a meta-analysis to interpret a disparate and diverse range of evidence that has rarely been brought together. Having done so, it is clear that, for the majority of addiction science disciplines, there is a lack of specific studies focusing on risky behaviour as an outcome. This is particularly apparent for disciplines which focus upon individuals, such as psychology and economics, in which there is a paucity of literature regarding initiation and escalation of risky behaviours. Instead the focus is typically on alternative outcomes associated with addiction or overtly harmful drug use or gambling behaviours, such as indices of harm, addiction or dependency.

When risk is presented as an outcome, cross-study comparison is hindered by substantial variation in what is considered to be risky behaviour and in the measurement of potential determinants of that behaviour. For example, key determinants of risky behaviour identified,

such as early age of initiation, impulsivity and what is considered as risky in terms of frequency, pattern and volume of usage, are often different from study to study. Similarly, whereas some studies consider novelty and sensation seeking as separate to impulsivity, others include such characteristics within the umbrella term of impulsivity and often no definition of the criteria used to obtain measures of impulsivity is given. Defining the level of use at which engaging in risky behaviours becomes significantly risky, for example exceeding five drinks in one session for binge drinking, also often varies between studies. In general, inferring conclusions, and quantifiable conclusions in particular, from such studies is difficult since incompatibilities allow no clear comparisons to be made. Although the definition of risk used in this report conceptually works to define the multitude of risks associated with addictive substances and gambling; in practice the literature does not neatly organise itself into distinct categories of 'risk' or 'harmful use' or 'addiction',

Despite the difficulties in comparing risk across studies and between disciplines, several determinants were identified which featured in more than one model and across several disciplines. This demonstrates a scientific convergence on key concepts, and adds weight to conclusions that those concepts are important in the determination of risky behaviours. These overlaps will be summarised in the following section, however it should be noted that much of the evidence surrounding them is drawn from studies of outcomes more focused on addiction and overtly harmful behaviour, rather than models of risky behaviour itself. Inferences have been made to establish whether determinants apply to risky behaviour, rather than just addiction and over-interpretation of the strength of this evidence should consequently be avoided. Further, disciplines such as genetics and neurobiology focus very heavily on addiction itself, with the research approaches used not conducive to establishing risk associated with non-addicted substance use or problem gambling. Genetic, preclinical or clinical studies tend to look for observable determinants within subjects who can be classified as addicted using quantifiable measures. Risk is often inferred or defined retrospectively from these subjects rather than being a starting point for analysis. Stronger evidence on risky use is contributed by sociological, psychological and environmental models which are better developed and defined for this topic and often use large prospective studies which permit measurement of both potential determinants and outcomes before risky behaviour occurs and monitoring to see how these relate to the risky behaviour.

4.1.1 Key determinants

Below we briefly outline the factors which were identified as important determinants across multiple disciplines.

4.1.1.1 Context of use

The setting in which an individual takes a drug has clear influences on riskiness of that behaviour. Social environmental models outline that the setting is key for individual learning associated with risky behaviour and, further, setting is important in the sensation of enjoyment experienced with the behaviour. The role of setting is also highlighted by individual-level studies as it can lead to biases in decision making which can affect both the affective and deliberative system and contribute to the decision making process. The role of peers can be isolated as an important aspect of the behavioural setting. For example, being the dominant individual may decrease your risky behaviour and your actions are likely to directly influence your surrounding peers. Peer group pressure, which is commonly cited by many of the models at the individual and social environmental levels, also acts as a key factor in determining engagement in risky behaviours and increased levels of use.

4.1.1.2 Social status

Peer pressure is part of a wider concept of social status, which arises at all three levels of analysis as a determinant for risky substance use and risky gambling. Across the disciplines reviewed, social status can refer to status within a small peer group, society-wide economic systems, historically-rooted class structures and perceptions associated with these. At the base level of molecular and cellular analysis, it was seen that increased social status gave rise to increased dopamine receptor levels which appeared protective against risky behaviours. At the individual level, being of a low social status is highlighted within the theory of rational addiction and the stress-vulnerability model as increasing the propensity for the individual to engage in risky behaviour, with societal disengagement and coping mechanism presented as explanations for this propensity. Jessor's theory of problem behaviour and Moffitt's theory of life-long and adolescence-limited antisocial behaviour also cite decreased social status amongst adolescents as determinants of risky behaviour. Finally, social environmental models of socioeconomic marginalisation point to individuals using risky behaviours as a method of increasing social status within their social networks. Education, which may in part be determined by social status, was also highlighted across the levels of analysis as an important determinant of risky use and behaviour. Highlighted within both economics and psychology the lack of knowledge surrounding drug use was shown as a critical determinant for risky use. In addition to this evidence, it is important to understand the interplay between social status and other determinants of risky use. For example, although increased social status in itself may be protective for risky use, those with a higher social status may have increased wealth or power and thereby may have increased access and availability to a drug.

4.1.1.3 Availability

Availability is a key determinant in itself and has been clearly highlighted across anthropology, economics and sociology as having a pivotal role. Ease of access and increased access to substances and gambling opportunities are also repeatedly cited by many models as important determinants of both initiating behaviours and increasing use. Thus this determinant traverses disciplines from both the individual and social environmental levels of analysis. This refers to individual access to substances and gambling through peer influence and the gateway theory, as well as increased access through higher levels of marketing and promotion of such activities and increased availability of substances through policy and law enforcement governing the use and legality of such behaviours.

4.1.1.4 Young age at onset of use or gambling

It is well established that early onset and regular use of psychotropic substances and regular gambling in childhood and adolescence is associated with a wide range of acute (accidents, aggressive behavior, reduced school and work activity) and long-term risks (diseases, harmful use including addiction). Risk factors for early use are related to peer pressure and protest behavior against adults (see above), lack of knowledge about risky behavior and not yet adequately developed cognitive control competences (compared to the automatic, pleasure oriented behavior, cognitive control develops rather late in adolescence and early adulthood).

4.1.1.5 Impulsivity

Impulsivity is outlined as being associated with low dopamine receptor levels at the molecular and cellular level of analysis, while at the individual level this is reflected within psychosocial and other psychological models as being strongly associated with the period of adolescence, with externalising disorders and also with delayed discounting.

4.2 Measuring risk

When considering the available literature it is clear there is currently no standardised approach to measuring risky substance use and risky gambling. The studies considered within this report use diverse and often disparate terminology for describing risky behaviour and these make clear comparisons difficult. This presents challenges for scientists in assessing this evidence and for policy makers in determining appropriate levels of controls to be applied to different addictive substances and behaviours.

Varying outcome measures are due in part to the complex nature of risks arising from addictive substance use and gambling. In these contexts, risks are broad and relate to multiple different

outcomes across many domains. For example, risky alcohol consumption alone increases the likelihood of experiencing a range of chronic diseases, various acute injuries, absenteeism and unemployment. It is also associated with being a victim or perpetrator of crime or low-level disorder and is believed to contribute to reduced well-being amongst the drinker's immediate family and social network, deleterious effects on child development and reduced productivity in the economy. Each of these outcomes will be measured in differing ways and the thresholds where increased risks become 'material' (in the terms of this reports' definition of risky behaviour) will vary. Complexity increases still further when factoring in the varying potential outcomes and thresholds for risk associated with the full range of licit and illicit substances under consideration and, additionally, gambling. It may be possible to provide an overall index of risk by deriving a composite measure of the risk of these various potential outcomes. This would be a standardised measure incorporating many different risky behaviours based on an understanding of the risks for each element of the drug or type of gambling that is being considered.

A measure for risk associated with substance use or gambling should consider both the multiple risks associated with use, but should also include an assessment of positive use value and how the balance of positive and negative effects compares against other. Engagement with substances of abuse and gambling can be an inherently rewarding activity and many aspects of the behaviour can provide a positive experience for the user. However, the same is true of driving and, just as driving a car is a risky activity but has the benefits for the user in reaching their destination quickly and comfortably, there are many aspects of positive drug use, as outlined in the introductory section to this report, which should be incorporated into an assessment of risk before deciding what restrictions governments should place on the activity.

There is great value in deriving a standardised method for quantifying risk. If it is argued that policy making decisions should be made following a rational discussion of the evidence, this can only be effective once a framework for encapsulating and coherently analysing relevant data exists. In the UK there has been a quantification of harm index produced for drugs and it is possible to envision a similar analysis could be performed considering risky substance use and risky gambling (Nutt, King & Phillips, 2010). Factoring potential benefits into such an exercise may, however, present greater challenges due to the difficult of quantifying these benefits and the lack of research which has been done to address this obstacle.

4.3 Risk in context of societal conditions

Risk is not inherent for all aspects of substance abuse and problem gambling, rather risk may stem from the society and context in which behaviours take place. This is an important discussion point since, for any quantification of risks pertaining to a particular behaviour, appropriate consideration must be given to these mediating or moderating factors. Relevant contextual factors may include the demographic structure of those engaging in risky behaviour, the socioeconomic conditions of the society and the individual in question and the economic or political stakeholders in societies and how their perspectives and influence manifest in formal and informal social controls. The harms from cannabis are yet to be fully defined; however, the illegal nature of cannabis in many countries means risks and, potentially, financial costs to the user are substantially increased as they may experience punitive criminal processes, social stigma and exposure to the risks associated with illicit drugs markets. Clearly benefits may also alter as engagement in illicit behaviour may confer enhanced social status and increase the 'thrill' of the activity.

Society will vary in the level of acceptable risk they are willing to tolerate and the reasons for this may be politically, empirically or culturally determined. Many risks are tolerated for the necessity or benefits the action brings and this is well illustrated in the example of car driving. The action itself carries considerable risk of harm and injury to the driver, any passengers, other road users, pedestrians and the environment. However, society accepts these risks so as to embrace quick and comfortable transportation. To mitigate the risks of car driving, several decisions have been made to proscribe speed restrictions, road regulations and acceptable carbon emissions and although similar decisions have been made with regards to substances of abuse and gambling, it is not clear that the two decisions are taken on similar interpretations of acceptable levels of risk when balanced against benefits. In other words, some drugs are automatically assigned a risky status without the rationale for this assignment being unclear. A similar distinction is made between legal and illegal drugs without it being empirically demonstrable using current evidence that this is due to differences in the risks associated with legal and illegal drug use. In reality, policy decisions made with regards to drugs can often be highly moralized and influenced by various powerful stakeholders and these influence are not necessarily improper. Clearly, actuarial balancing of risks and benefits are not and should not be the sole consideration in policy decisions; the optimal decision making model would also, for example, consider the rights of the individual to engage in their chosen activities whilst simultaneously giving consideration to the protection of both the individual and society from risk. Providing a transparent means for evidence-based discourse about risk is clearly important to policy decisions and may inform better decision-making as well as enabling a

rational discussion as to what level of risk a society deems acceptable. An independent method for comparison of risks may prove immensely valuable to this process; however, the findings of this research suggests more work is required by addiction scientists to deliver the necessary evidence on risky behaviour in particular.

4.4 Limitations

Expert researchers from several disciplines appraised the most relevant literature and models available from their own discipline's perspective. Whilst this should ensure a representative view of each discipline and coverage of major works, it is possible that certain models or studies have been excluded and the expert consensus in choosing models for incorporation into the report has overlooked specific concepts. Resources also meant that relevant disciplines such as history, evolutionary biology and politics were not included in the interdisciplinary work. Were other experts from each discipline or from different disciplines recruited to the project it is likely that the nature of the evidence and the models and determinants selected would change. However, this limitation is inherent in the nature of any project of this kind, and only by means of increasing the number of transdisciplinary projects within this field to allow comparative studies will a full reflection of the field be allowed.

4.5 Conclusions

This report has provided an all too rare integrated review of the determinants of risky behaviour and use associated with substances of abuse and gambling. The above findings can be used to aid decision making for future funding and research directions. It is hoped this knowledge can be used to inform future policy making decisions across Europe and provide a basis for progress in treating outcomes related to substance abuse and gambling problems.

Firstly, this report highlights a need to develop more standardised definitions of risky substance use and risky gambling as specific behaviours. Despite being investigated in numerous ways across different disciplines, the disparate approaches to risky behaviour presented suggest understanding is being limited in the most basic way by difficulties in presenting a coherent integration of the evidence. A lack of commonality in the way risk is operationalised in research also means results can often not be translated across scientific disciplines. Addressing this so as to facilitate increased integration of evidence and interdisciplinary research within the field of risky behaviours is important and could lead to the highlighting of key areas for policy intervention as well as the identification of at risk groups. A key enabler of such work would be to establish interdisciplinary definitions of risky behaviour which can be used consistently and

are interpretable by each discipline. Definitions should encapsulate the multiple elements of risk, including both health and social risks in addition to positive and negative consequences of use. Once a common framework has been derived to define risky behaviour, this can be used across disciplines to research such behaviour.

Secondly, this report confirms an initial starting point for ALICE-RAP; namely that scientific focus is insufficiently extended beyond the narrow concept of addiction. In examining the models and determinants identified, it is clear risky substance use and other potentially harmful addictive behaviours can occur without an individual being addicted in any recognisable way. The models presented in the results provide an informative overview for risky behaviour associated with substance abuse and gambling. They also provide a broad set of determinants which contribute to an interdisciplinary understanding of antecedents of risky behaviour. In collating the available evidence across the disciplines, we have identified that disciplines converge in several common areas (e.g. impulsivity, social status, behavioural contexts), despite approaching the subject with different scientific perspectives and methodological techniques. Much of the field of addiction studies is converging on similar key elements which indicate increased likelihood of engaging in risky substance use and risky gambling behaviours. Greater understanding of risky behaviour will aid the identification of targets for future interventions and, in addition to reducing the harm experienced due to risky behaviour, intervening earlier in behavioural trajectories may prevent the individual from progressing into harmful substance use or problem gambling. As such, it is important to understand risky behaviour relating to addictive substance use and gambling both as a policy concern in itself, and as a potential early stage in the development of addiction.

5. References

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