

What Drives Underage Drinking? An International Analysis

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Executive Summary

This report explores the basis of underage drinking from the epidemiological, biomedical, and cultural perspectives and reviews their implications for future research, education, and government policy. The intent is to contribute to the ongoing debate over appropriate and effective responses to the risks posed by early alcohol debut and misuse.

The report is broadly divided into two parts. The first part consists of three articles: Dr. Marie Choquet examines the epidemiological data on underage drinking, Dr. Linda Patia Spear then reviews the biomedical aspects of early alcohol exposure, and Dr. Gonzalo Araoz concludes with his section on cultural considerations. The second part of the report provides three commentaries that assess the articles' implications for researchers (by Dr. Susumu Higuchi), educators (by Jeffrey Lee), and policy-makers (by Godfrey Robson). The main conclusions of the authors and the commentators are as follows.

Epidemiological data

Presenting the epidemiological perspective, Choquet stresses that significant variations in methods measuring alcohol consumption warrant caution in data comparison across national borders. Surveys, like the European School Survey Project on Alcohol and Drugs (ESPAD), enable effective comparison among most developed countries. According to these surveys, on average, adolescents consume less alcohol than adults, and harmful underage drinking is more prevalent in so-called "dry" countries, where alcohol is perceived with ambivalence, than in "wet" areas, where it is accepted. Data for developing countries are less standardized, yet common trends may be discerned: most societies in the emerging markets exhibit lower lifetime alcohol consumption rates than in the developed world. Adolescents worldwide are contributing to the internationalization of alcoholic beverages (beer, in particular) and to the progressive abandonment of national drinks. In addition, models of consumption differ according to gender and other factors that vary from culture to culture. Choquet posits that further efforts are necessary in developing international criteria sensitive to cultural differences and calls for youth- and gender-specific surveys and research, in particular from "wet" and developing regions. The author concludes that adolescent drinking should not only be interpreted in terms of risks and negative effects, but that increased attention should be given to cultural, social, and personal factors of moderate consumption.

Biomedical aspects

Spear uses a biomedical approach to examine developmental transformations in the adolescent brain. She then assesses their potency in fostering early alcohol exposure and addresses the consequences of this exposure for the growing organism. The discussion is restricted by the ethical impossibility of experimenting on humans, minors in particular, and by the imperfect transferability of data derived from animal models to human adolescents. Nevertheless, it is reasonable to infer significant developmental peculiarities in alcohol responsiveness of teens and their potentially adverse effects: reduced sensitivity to some intoxicating effects may permit and foster greater consumption, yet this exposure may have more adverse effects on brain plasticity and memory processing in adolescents than in adults. Disagreement among scholars prevents linking such early exposure to later problem drinking. Spear concludes that, while most teenagers are exposed to alcohol, few develop the patterns of drinking that lead to problematic drinking and alcohol dependence. According to the author, stressors of adolescence may trigger early alcohol use and misuse, particularly in individuals whose genetic background or early life experiences place them at risk.

Cultural considerations

Araoz examines the cultural dimensions of underage drinking, by tracing the dynamic relationship between life cycles and drinking patterns as they are transformed through time and space. After reviewing the general ethnographic literature, the article illustrates some drinking patterns among adolescents from different cultural contexts around the globe. More detailed sketches, emerging from the author's field experiences in Bolivia, augment the discussion. The question at stake, the author believes, is not how to regulate and control the use of alcohol to benefit the world's adolescents, but rather how to learn from those societies that have successfully integrated healthy alcohol consumption into their social, religious, and family life. Araoz concludes that there is no reason to exclude

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any interested party from the debate, provided that they are transparent in their intentions and that they behave responsibly.

Commentaries

In assessing the implications of the three above studies for research, Higuchi adds the example of Japan and briefly outlines research findings on underage drinking that were not mentioned by Choquet, Spear, and Araoz. In his analysis of the authors' future research recommendations, Higuchi emphasizes three areas of further inquiry: elucidating effects of moderate drinking; advancing research on primary and secondary prevention; and developing a global research network.

From the point of view of educators, Lee writes, the papers are a welcome contribution to the discussion of underage drinking. Yet if these studies and the issues they raise are to be added effectively to the education agenda, further work is necessary in order to develop them into a usable format, with appropriate methodology, and alongside other pertinent issues that inform the present debate and its development.

Finally, from the public policy perspective, the three papers lead Robson to argue for a less rule-based governmental approach, especially in dry countries. Instead he makes the case for "changing the culture" by tackling underage drinking as part of a broader societal pathology. Government's real influence here is limited, Robson concludes, and much emphasis is to be placed on the public health community and public-private partnerships, that would include the industry.

Sommaire

Le rapport ci-après examine les raisons qui conduisent les adolescents et les jeunes adultes à la consommation précoce de l'alcool. A travers des perspectives épidémiologiques, biomédicales et culturelles, il étudie les implications futures pour la recherche, l'éducation et la politique gouvernementale. L'objectif d'une telle étude est de contribuer au débat actuel sur les réponses, adéquates et efficaces, qui peuvent être apportées aux risques posés par la consommation précoce de l'alcool et par son utilisation inappropriée.

L'étude est constituée de deux parties principales. La première se compose de trois articles: tout d'abord, le Dr. Marie Choquet examine les données épidémiologiques de la consommation précoce de l'alcool ; le Dr. Linda Patia Spear passe ensuite en revue les aspect biomédicaux d'une exposition à l'alcool à un âge précoce. Enfin, le Dr. Gonzalo Araoz conclut cette partie avec une section consacrée à des considérations culturelles.

Dans la seconde partie du rapport, trois commentaires évaluent les implications de l'article pour les chercheurs (par le Dr. Susumu Higuchi), pour les éducateurs (par Jeffrey Lee), et pour les décideurs politiques (par Godfrey Robson). Les conclusions principales des auteurs sont les suivantes :

Données épidémiologiques

Le Dr. Choquet propose une perspective épidémiologique. Elle souligne qu'en raison de la grande disparité des méthodes de mesure de la consommation d'alcool, il convient d'être extrêmement méticuleux lorsque l'on compare les données au-delà de frontières nationales. Certaines enquêtes, comme l'ESPAD, permettent d'effectuer une comparaison efficace des données pour la plupart des pays industrialisés. Ces sondages font apparaître que d'une part, les adolescents consomment en moyenne moins d'alcool que les adultes et que d'autre part, la consommation précoce et néfaste de l'alcool est plus importante dans les pays dits "dry" (secs) où l'alcool est perçu de façon ambiguë, qu'elle ne l'est dans les régions dites "wet" (mouillées) où il est mieux accepté. Les données disponibles sont moins standardisées pour les pays en voie de développement. On peut toutefois discerner quelques caractéristiques communes: les études montrent que dans la plupart des sociétés nouvellement industrialisées, le taux de consommation d'alcool - au cours d'une vie humaine - est moindre que dans le monde développé.

Ce sont surtout les adolescents qui, dans le monde entier, contribuent à l'internationalisation des boissons alcoolisées (la bière, en particulier) et à l'abandon progressif des boissons locales. On remarque, en outre, que les modèles de consommation diffèrent en fonction du sexe et de certains autres facteurs et varient d'une culture à l'autre. Le Dr. Choquet suggère qu'il serait utile de développer des critères internationaux qui prennent en compte les différences culturelles. Elle demande que soient effectuées des études et des recherches spécifiquement orientées vers les jeunes et vers la répartition par sexe, et ce, en particulier dans les régions dites "wet" (mouillées) et en voie de développement. L'auteur conclut que l'utilisation de l'alcool chez les adolescents ne doit pas être seulement interprétée en termes de risques et d'effets négatifs mais qu'il serait bon de donner plus d'importance aux facteurs culturels, sociaux et personnels de la consommation modérée.

Aspects biomédicaux

Le Dr. Spear utilise une approche biomédicale et examine les transformations qui affectent le développement du cerveau de l'adolescent. Elle évalue ensuite dans quelles mesures ces transformations favorisent l'exposition précoce à l'alcool. Elle montre ensuite les conséquences de cette exposition sur un organisme en mutation. L'impossibilité morale d'expérimenter sur des sujets humains, mineurs en particulier, et l'imparfaite transférabilité des données du monde animal vers l'adolescent humain, constituent un obstacle certain au débat. Il semble toutefois raisonnable d'en déduire un certain nombre de caractéristiques en ce qui concerne la réceptivité des adolescents à l'alcool et ses effets pervers : une sensibilité limitée à certains des effets intoxicants de l'alcool peut faciliter ou provoquer une consommation plus abondante. D'autre part, cette exposition peut avoir des effets plus néfastes sur l'élasticité du cerveau et sur la mémoire pour les adolescents que pour les adultes. L'existence de désaccords au sein du monde de la recherche ne permet pas d'établir un lien entre l'exposition précoce à l'alcool et d'ultérieurs problèmes de boisson. Le Dr. Spear conclut que si la plupart des adolescents sont exposés à l'alcool, peu d'entre eux développent des schémas d'usage problématique ou d'alcoolsime. Selon elle, les tensions de l'adolescence peuvent déclencher l'usage et l'abus précoce de l'alcool, en particulier chez les individus "à risque", rendus plus vulnérables par leurs antécédents génétiques ou par leur passé.

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Considérations culturelles

Le Dr. Araoz analyse la dimension culturelle de la consommation précoce de l'alcool en établissant une relation dynamique entre les cycles de la vie et les schémas de boisson au cours de leur évolution spatio-temporelle. Après une revue de la littérature ethnographique générale, l'article illustre des schémas de boisson chez les adolescents de culture différentes et à travers le monde. L'auteur alimente la discussion par une description détaillée de son expérience sur le terrain en Bolivie. Selon lui, il ne s'agit pas de réguler et de contrôler l'utilisation de l'alcool pour le bénéfice des adolescents mais plutôt d'apprendre comment ces sociétés ont réussi à intégrer une consommation saine de l'alcool dans leur vie sociale, religieuse et familiale. Il conclut qu'il n'y a aucune raison d'exclure du débat des acteurs intéressés à partir du moment où leurs intentions sont transparentes et leur conduite responsable.

Commentaires

Le Dr. Higuchi évalue les implications des trois études précédemment citées pour la recherche et ajoute l'exemple du Japon. Il évoque certaines découvertes scientifiques qui n'ont pas été mentionnées par les Dr. Choquet, Spear, et Araoz. Dans son analyse, le Dr. Higuchi recommande de poursuivre la recherche scientifique dans trois domaines principaux: 1) élucider les effets de l'alcool consommé avec modération, 2) continuer la recherche sur la prévention primaire et secondaire et 3) développer un réseau global de recherche.

M. Lee écrit du point de vue des éducateurs ; il pense que si ces recherches sont utiles pour le débat sur la consommation précoce de l'alcool, il s'agit d'intégrer efficacement les questions qu'elles soulèvent dans des programmes éducatifs. Des efforts supplémentaires seront nécessaires pour les adapter et les rendre utilisables avec une méthodologie appropriée et concomitamment avec d'autres questions pertinentes qui alimentent le débat actuel.

Enfin, du point de vue politique et après lecture des trois articles scientifiques, M. Robson conclut qu'il conviendrait d'adopter une politique moins normative, en particulier dans les pays dits "dry" (secs). Il propose un "changement de culture" qui consisterait à aborder la question de la consommation précoce de l'alcool comme l'élément d'une pathologie sociétale plus large. Selon lui, l'influence réelle du gouvernement dans ce domaine est relativement limitée et il conviendrait de se concentrer davantage sur les milieux de la santé publique et sur des partenariats entre les secteurs publics et privés (qui incluraient le monde industriel).

未成年者の飲酒の原因

国際的な分析

アルコール政策国際センターによる委託研究

論旨

この報告書では、疫学的、生命医学的、文化的見地から未成年者の飲酒の原因を調査し、将来の研究、教育、政府の政策のための指針を論じています。本書の目的は、早期の飲酒開始や誤った飲酒によって引き起こされる危険に対しての適切で有効な対応について現在活発に行われている討論に役立てることです。

この報告書は、大きく2部で構成されています。第1部は、3つの論文から成っています。マリー・チョーケット博士は、未成年者の飲酒における疫学的なデータを検討しています。次にリンダ・パティア・スベア博士は、早期年齢での飲酒の生命医学的見地から調査を行っています。また、ゴンザロ・アラオズ博士は文化的考察についてまとめています。報告書の第2部は、3つの論評から成り、樋口進博士による研究者のための、ジェフリー・リー氏による教育者のための、ゴッドフリー・ロブソン氏による政治・行政に関わる人々のための第1部の論文の批評を提供しています。

疫学的データ

疫学的な見地から、チョーケット氏は、様々な国々のデータを比較し、飲酒に対する注意や警告を比較する方法に関しての顕著な違いを強調しています。ESPADのような調査では、ほとんどの先進国の間での有益な比較が可能です。これらの調査によれば、平均的には、青少年のアルコール消費は、成人よりも少ないです。また、有害な未成年者の飲酒は、飲酒が容認されている「非禁酒」地域よりも、いわゆる飲酒に対して複雑な感情を持っている「禁酒」国においてより多く見られます。開発途上国のデータは、あまり統一化されていませんが、一般的な傾向は認められます。多くの発展途上国の社会では、先進諸国よりも生涯のアルコール消費割合が低いことを示しています。世界中の青少年の趣向の変化が、アルコール飲料(特にビール)の国際的な人気と自国の独自の飲み物のますますの不人気の原因となっています。さらに、飲酒のモデルは、文化ごとに異なるジェンダー(性別の問題)やその他の要因によってさまざまです。チョーケット氏は、文化的な差違を考慮した国際的な基準を築き上げるためのさらなる努力が必要であると述べると共に、特に「非禁酒」地域や発展途上国での若者やジェンダーに特有の調査および研究の必要性を求めています。青少年の飲酒は、危険性やマイナスの影響の観点から理解されるだけでなく、適切な飲酒の文化的、社会的、個人的要因に対しても、さらなる注意が払われるべきだと結論づけています。

生命医学的見解

スベア氏は、青少年の脳の中での発達上の変化を考察するために、生命医学的なアプローチを試みました。その後彼女は、早期の飲酒を助長する場合の可能性を調べ、成長を続けている身体への飲酒の影響を論じています。この議論は、人間、特に未成年者を実験に用いることは倫理的に不可能であること、さら

には動物のモデルから人間の青少年へとデータを転用することは不完全であることから限界があります。しかしながら、十代の青少年の飲酒に起因する著しい発達上の特徴およびそれらの悪影響については理にかなっています。飲酒に起因する感受性の低下は、さらなる飲酒を引き起こし、助長するかもしれません。しかし、飲酒は、大人よりも青少年の脳において適応性や記憶処理に対するより多くの悪影響を持っているかもしれません。学者の中での意見の不一致は、早期の飲酒と後の問題的な飲酒とを関連づけることの妨げとなっています。スベア氏は、多くの10代の青少年は飲酒経験を持っているが、問題となるような飲酒やアルコール中毒へと至るような飲酒習慣を築くものはほとんどいないと結論づけています。青少年のストレス要因が、特に遺伝的背景や幼少期の人生経験から危険にさらされている人々の場合に、早期の飲酒やアルコールの悪用を引き起こすことがあるのでしょうか。

文化的考察

アラオズ氏は、時間と空間によって変化する、ライフ・サイクルと飲酒パターンの機能的な関係を追求することによって、未成年者の飲酒を文化的な見地から検証しています。一般的な民族学の文献を批評した後、この論文では、世界中の様々な文化的状況からいくつかの青少年の飲酒のパターンを例証しています。アラオズ氏のボリビアでの現地調査の経験からのより詳細な解説が、議論を活発にしています。問題となっているのは、世界中の青少年に役立つような飲酒を規制し管理するための方法ではなく、社会生活、宗教生活、家族生活で健全な飲酒の統合に成功した社会から学習する方法である、とアラオズ氏は信じています。アラオズ氏は、もし意図が明確であり、責任を持って行動するならば、この議論から興味を持った人々を除外する理由がない、と結論づけています。

論評

第1部で取り上げた3つの研究を評価するにあたり、樋口氏は日本での事例を加えています。また、チョーケット氏やアラオズ氏が取り上げなかった未成年者の飲酒に関するさらなる発見に関して簡潔に概略をまとめています。樋口氏はこれから将来的に研究や分析を推奨する点として、さらなる3分野の問題を強調しています。1. 適切な飲酒の影響の解明、2. 一次的・二次的な予防についての研究の推進、3. 世界的な研究ネットワークの発達。

リー氏は教育者としての視点から見て、これらの論文は未成年者の飲酒の議論への歓迎される貢献であると、書いています。しかし、これらの研究やそれが引き起こす論争が教育方策に効果的に加えられるならば、実際に利用できる形式にこれらの研究を応用し、適切な方法論と現在の議論やその進展を知らせための他の関連した問題と一緒に、さらなる研究が必要です。

最後に、3つの論文に基づきロブソン氏は、公共政策の見地から特に「禁酒」国であまり規則に基づいていない政府の取り組みについて論じています。彼は、より広い意味での社会的な病理学の一部として未成年者の飲酒を追求することで「文化の変化」を論じています。この部分での政府が及ぼす実際の影響は限られており、また公衆衛生に携わる人々、酒類産業をも含めた官民の協力が大きく強調される、とロブソン氏は結論づけています。

Краткое резюме

Данный отчёт исследует проблему употребления алкоголя в юношеском возрасте с точки зрения эпидемиологии, биомедицины и этнографии. Целью данного документа является внесение вклада в дискуссию о разработке эффективных программ по борьбе с потреблением и злоупотреблением алкоголя несовершеннолетними.

Отчёт разделен на две основные части. Первая часть состоит из трёх статей: Д-р Мари Шокэ исследует эпидемиологический материал о раннем опыте употребления спиртных напитков; затем, д-р Линда Патаи-Спеар рассматривает биомедицинские аспекты воздействия алкоголя на юношеский организм; в заключение, д-р Гонзало Араоз предлагает этнографический взгляд на эту же тему. Вторая часть отчёта представляет собой комментарии, которые определяют значение этих трёх статей для исследователей (автор – д-р Сусуму Хигучи), педагогов (автор – Джеффри Ли) и государственных деятелей (автор – Годфри Робсон).

Эпидемиологический материал

Представляя точку зрения эпидемиолога, д-р Шокэ подчёркивает серьёзные различия в методах, измеряющих уровень потребления алкоголя. Это значительно осложняет задачу сравнения данных, предоставленных учёными и исследователями из разных стран. Тем не менее, такие программы опроса и регистрации употребления алкоголя среди молодежи, как ESPAD,¹ позволяют провести сравнения среди наиболее развитых стран. Согласно таким опросам, в среднем, подростки потребляют алкоголь в меньших количествах, чем взрослые, в то время как злоупотребление спиртными напитками наиболее распространено в так называемых “сухих” странах, где потребление алкоголя запрещено или социально неприемлемо, нежели в тех странах, где алкоголь является неотъемлемой частью повседневной жизни. Данные по развивающимся странам менее стандартизированы. Однако, и там можно найти некоторые общие тенденции: в целом, в большинстве стран с низким доходом и на новых рынках уровень потребления алкоголя в течение жизненного цикла является ниже, чем в развитых странах. Подростки по всему миру вносят существенный вклад в интернационализацию спиртных напитков (в особенности, пива): популярность традиционных алкогольных напитков переживает некоторый упадок. В то же время, модель потребления алкоголя зависит от пола и прочих факторов, которые меняются от страны к стране. Шокэ утверждает, что необходимо развитие международных критериев, которые смогут принять в расчёт культурные различия между разными странами. Более того, необходимы международные исследования и опросы, специально рассчитанные на подростков и представителей того или иного пола, и в особенности в развивающихся странах и странах, где алкоголь является частью культурной традиции.

Биомедицинские аспекты

Д-р Патаи-Спеар, используя биомедицинский подход, исследует возрастные изменения мозга у подростков. Автор поднимает два основных вопроса: каким образом эти изменения располагают к раннему знакомству с алкоголем и каковы последствия подобного опыта для растущего организма. Следует заметить, что по этическим соображениям эксперименты и исследования на людях, и в особенности на несовершеннолетних, не всегда возможны. Это часто ограничивает исследования воздействия алкоголя на подростков опытами на молодняке лабораторных животных, при которых полученные сведения являются косвенными. В результате подобных исследований, однако, можно сделать вывод об определённых биологических особенностях в реакции подростков на алкоголь и о связанных с этим патологических изменениях. Например, подростки в среднем обладают пониженной восприимчивостью к некоторым признакам опьянения, что может поощрить потребление спиртных напитков. В то же время, по сравнению со взрослым организмом, алкоголь имеет более серьёзное негативное влияние на пластичность мозга и память подростка. Разногласия среди исследователей не позволяют построить прямую связь между употреблением алкоголя в юном возрасте и его злоупотреблением во взрослой жизни. Д-р Патаи-Спеар отмечает, что в то время как большинство подростков имеют определённый опыт знакомства с алкоголем, лишь у немногих из них развивается патологическая тяга к спиртному. Согласно автору, трудности взросления могут способствовать началу

¹ Европейский опрос ученической молодежи относительно употребления алкоголя и наркотических веществ (The European School Survey Project on Alcohol and Drugs)

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потребления и злоупотребления алкоголем лицами юношеского возраста, чьи генетические данные и ранний жизненный опыт ставят их в группу риска.

Этнографический взгляд

Д-р Араоз рассматривает влияние культурных традиций на раннее потребление алкоголя. Вслед за кратким обзором этнографической литературы, его статья приводит примеры обстоятельств, окружающих юношеское знакомство со спиртным в разных странах и культурах мира. Личный опыт автора с племенами, обитающими на территории Боливии, дополняет повествование. По мнению д-ра Араоза, главный вопрос на повестке дня должен быть не в том, как ограничить потребление спиртных напитков и таким образом оградить несовершеннолетних от проблем, связанных с алкоголем, а в том, как лучше воспользоваться опытом тех мировых культур, которые смогли успешно включить умеренное употребление алкоголя в свою повседневную жизнь. Автор считает, что все заинтересованные стороны без исключения должны принимать участие в дискуссии, демонстрируя при этом свою открытость и ответственность.

Комментарии

Обсуждая значение трех вышеуказанных статей для исследователей, д-р Хигучи приводит пример Японии и вкратце излагает данные, не упомянутые Шокэ, Патиа-Спеар и Араозом. Хигучи выделяет три основных темы для дальнейших исследований: влияние умеренных доз алкоголя, первичная и вторичная профилактика алкоголизма и развитие международной научной и образовательной сети.

С педагогической точки зрения, представленной Джеффри Ли, три статьи выгодно дополняют дискуссию о потреблении алкоголя в раннем возрасте. Тем не менее, вопросы, поднятые тремя авторами, должны быть разработаны далее, прежде чем они смогут стать неотъемлемой, эффективной, и привычной частью общественного просвещения.

В заключение, Годфри Робсон приходит к выводу, что формулировка и осуществление общественной политики в отношении алкогольных напитков, особенно в “сухих” странах, не должны быть сосредоточены исключительно в государственных учреждениях. Здесь Робсон поддерживает идею широкого партнерства между государственными инстанциями, органами здравоохранения, представителями потребителей, неправительственными организациями (НПО), а так же алкогольной индустрией и частным сектором.

Resumen ejecutivo

Este informe explora las bases del hábito de beber en los menores de edad desde las perspectivas epidemiológicas, biomédicas y culturales y revisa las implicaciones para el futuro de la investigación, la educación y las políticas gubernamentales. La intención es contribuir al debate existente respecto a las respuestas efectivas a los riesgos que conlleva el mal uso del alcohol a una edad temprana.

El informe está dividido en dos partes. La primera parte consiste en tres artículos: La Dra. Marie Choquet examina los datos epidemiológicos del hábito de beber en los menores, la Dra. Linda Patia Spear revisa los aspectos biomédicos de la exposición al alcohol a temprana edad y el Dr. Gonzalo Araoz concluye con una sección sobre las consideraciones culturales. La segunda parte del informe ofrece tres comentarios valorando las implicaciones de los artículos para los investigadores (por el Dr. Sujumu Higuchi), los educadores (por Jeffrey Lee), y aquellos que elaboran las políticas (por Godfrey Robson). Las conclusiones principales de los autores y comentaristas se presentan a continuación.

Datos epidemiológicos

Desde la perspectiva epidemiológica, Choquet remarca que las significativas variaciones entre los métodos para medir el consumo del alcohol requieren de especial cuidado al hacer comparaciones transfronterizas. Las encuestas, como la de ESPAD, hacen posible una comparación efectiva entre los países más desarrollados. De acuerdo con estas encuestas, el adolescente medio consume menos alcohol que el adulto y el hábito de beber en los menores de un modo perjudicial es más prevalente en los llamados países “secos” donde el alcohol se percibe como algo ambivalente que en áreas “no secas” donde se acepta el uso del alcohol. Los datos de los países en vías de desarrollo están menos normalizados, sin embargo se pueden discernir tendencias comunes: la mayoría de las sociedades en los mercados emergentes muestran tasas de menos consumo de alcohol durante la vida de una persona que en el mundo desarrollado. Los adolescentes de todo el mundo están contribuyendo a la internacionalización de las bebidas alcohólicas (de la cerveza, en concreto) y al progresivo abandono de las bebidas nacionales. Además, los modelos de consumo difieren según el género y otros factores que varían según las culturas. La posición de Choquet es que hacen falta mayores esfuerzos para desarrollar unos criterios internacionales que sean sensibles a las diferencias culturales y que traten por medio de encuestas e investigación el ámbito de los jóvenes y del género específico, en particular de las regiones “no secas” y en vías de desarrollo. El autor concluye que la bebida en los adolescentes no debe interpretarse en términos del riesgo y los efectos negativos sino que se debe prestar mayor atención a los factores culturales, sociales y personales del consumo moderado.

Aspectos biomédicos

Spear utiliza un método biomédico para examinar transformaciones del desarrollo en el cerebro de los adolescentes. A partir de ahí, evalúa la potencia de estas en cuanto a la exposición del alcohol a temprana edad y comenta las consecuencias que esta exposición tiene para el organismo en crecimiento. La discusión se restringe por la imposibilidad ética de experimentar en seres humanos, menores en particular, y por la transferencia imperfecta de datos derivados de modelos animales a los adolescentes humanos. No obstante, es razonable deducir peculiaridades significativas en el desarrollo de los adolescentes y sus potenciales efectos negativos: menor sensibilidad ante algunos de los efectos tóxicos podrían permitir y animar a un mayor consumo, aunque esta exposición puede que tenga mayores efectos negativos en la plasticidad del cerebro y el procesamiento de la memoria en adolescentes que en adultos. El desacuerdo entre los estudiosos impide relacionar la exposición al alcohol a temprana edad y el problema del hábito de beber más tarde en la vida. Spear concluye que mientras la mayoría de los adolescentes están expuestos al alcohol, pocos desarrollan los patrones del hábito de beber que llevan a un uso problemático del alcohol y al alcoholismo. Según el autor, los agentes de estrés en la adolescencia pueden disparar el uso del alcohol a temprana edad y el mal uso en particular por parte de individuos a los que sus antecedentes genéticos o tempranas experiencias ponen en riesgo.

Consideraciones culturales

Araoz examina la dimensión cultural del hábito de beber en los menores localizando la relación dinámica entre los ciclos de vida y los patrones de bebida al transformarse en estos en el tiempo y el espacio. Después de repasar la literatura etnográfica en general, el artículo ilustra algunos patrones de bebida entre los adolescentes de diferentes

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contextos culturales en el mundo. Esquemas más detallados que provienen de las experiencias de campo del autor en Bolivia contribuyen a la discusión. Según cree el autor el asunto en cuestión no es como regular y controlar el uso del alcohol para beneficio de los adolescentes del mundo, sino más bien como aprender de esas sociedades que han integrado con éxito el consumo saludable del alcohol en sus vidas sociales, religiosas y familiares. Araoz concluye que no hay razón para excluir a ninguna parte interesada del debate, siempre que sus intenciones sean transparentes y su comportamiento responsable.

Comentarios

En la evaluación de las implicaciones para la investigación de los tres estudios descritos, Higuchi añade el ejemplo de Japón y brevemente señala los resultados de una investigación sobre el consumo del alcohol entre los menores que no mencionan ni Choquet, ni Spear, ni Araoz. En su análisis de las recomendaciones de los autores para las futuras investigaciones Higuchi remarca tres áreas que deben investigarse más a fondo: aclarar los efectos de beber moderadamente; avanzar en la investigación de prevención primaria y secundaria; y desarrollar una red global de investigación.

Desde el punto de vista de los educadores, escribe Lee, los trabajos escritos son una contribución bienvenida a la discusión sobre la bebida entre los menores. Sin embargo si estos estudios y los temas que suscitan van a añadirse a la agenda de la educación, es necesario trabajar más para desarrollar un formato más útil, con metodología apropiada y que comprenda además otros temas pertinentes que informen el actual debate y su desarrollo.

Finalmente, desde la perspectiva de la política pública, los tres trabajos escritos llevan a Robson a argumentar a favor de un enfoque menos basado en la reglamentación por parte del gobierno, especialmente en países secos. Su caso se basa en “cambiar la cultura” atacando el hábito de beber entre los menores como parte de una más amplia patología social. La influencia real de los gobiernos en esto es limitada, concluye Robson, y se debe hacer énfasis mayormente en la comunidad de la sanidad pública y en las asociaciones público-privadas, las cuales incluirían a la industria.

Introduction

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Although the topic of underage drinking has been of concern for many years to those interested in preventing alcohol-related harm, international attention has recently increased sharply. There seem to be various reasons for this, including reports from countries in different parts of the world that drinking patterns among young people are changing and that more young people are choosing to drink to intoxication.

The purpose of this report, which was commissioned by the International Center for Alcohol Policies (ICAP)² is to look at some of the underlying assumptions about this topic and to review what their implications might be from three perspectives – those of research, education and government policy.

It is beyond the scope of this report to provide a complete international overview of young people's drinking and to chart within that the significance of the underage component. Rather, we have chosen to focus on source material that we hope will help to inform the debate and to assist those responsible for developing and implementing programs to make wise choices.

We have therefore included reviews of three key areas of scientific and scholarly inquiry and asked the authors to prepare them in a form which would be readily accessible to non-specialist audiences. The reviews examine the cultural, biological and epidemiological basis of underage drinking. While each perspective is valid in its own right, our hope is that by contrasting the insights of such diverse disciplines, we can both demonstrate the complexity of the issue and also indicate some possible ways ahead.

It is in everybody's interest to prevent the harm associated with underage drinking. At the same time, experience shows that there is no simple single solution. In ICAP Report No. 4: Drinking Age Limits, we provided information on the restrictions that exist in countries around the world regarding minimum age for the purchase and/or consumption of alcohol. In this report, we hope to provide insights into how best to respond to current concern in an informed and thoughtful way.

The views of the authors of the papers and the commentaries are those of the individual authors. ICAP has not sought to influence these in any way, nor do they necessarily reflect the views of ICAP or its sponsors. The report is a contribution to a critically important debate.

² The International Center for Alcohol Policies (ICAP) is a not-for-profit organization whose mission is to reduce the abuse of alcohol worldwide and to promote understanding of the role of alcohol in society through dialogue and partnerships involving the beverage alcohol industry, the public health community and others interested in alcohol policy. It is funded by 10 international drinks companies.

Underage Drinking: the Epidemiological Data

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Introduction

Adolescence is an intermediary period between childhood and adulthood. It is usually considered to begin at puberty and to finish at the age of legal majority. However, there is a wide inter-individual and international variability: the age of puberty may vary because of a wide range of genetic, nutritional and lifestyle determinants, and the age of legal majority differs from one country to another. Moreover, the definition of the beginning and end of adolescence also varies according to whether somatic, social, cultural or psychological criteria are considered (Tursz & Cook, 1997). Therefore, for practical reasons, this study is based on the definition according to age (10 to 19 years) which is mainly based on a “statistical commodity”. Indeed, the health data of the World Health Organization are published according to age group, and the group 10 to 19 years corresponds the most closely to what may be termed “adolescence” in most countries.

Alcohol is a very widespread psychoactive substance throughout the world, even though the products marketed and their availability varies considerably from one country to another. For example, in the Mediterranean countries, the wide range of beverages, including not only wine and beer but also cider, champagne and many types of strong alcohol, is accompanied by a large availability (sales outlets, moments of ritual consumption, social acceptability), unlike in the Muslim countries where alcohol is forbidden by religion. Despite this difference, the consumption of alcohol is forbidden to minors in most countries, a prohibition which may concern both its sale (in cafés, restaurants and stores or on the roadside) and promotion (advertising forbidden in the media and during sporting events, etc.). However, despite the minimum legal drinking age, young people under this age level can easily obtain alcohol (Fletcher et al., 2000).

Three categories of users are usually distinguished (DSM IV): “users” who use a substance rarely, occasionally, or even regularly, whose behavior is not maladjusted and does not harm the subjects or their families; “abusers” whose use is inappropriate because it has undesirable and recurrent consequences; and “dependents” whose use leads to clinically significant changes in functioning and pain. Yet between experimenting with a substance and being dependent upon it, there are many intermediary forms of behavior, particularly during adolescence, where dependence on alcohol is rare (Kandel et al., 1997) but where consumption of alcohol may be more or less regular. A number of terms are used to describe these states, including “chronic drinking,” “alcohol misuse,” “heavy drinking,” “regular drinking,” and “hazardous drinking”. The periods usually used to measure consumption are lifetime, last year, last six months and last 30 days. Sometimes the time spent is unclear. Owing to this wide range of measurements and definitions, caution is required when comparing levels of consumption between countries (Bloomfield et al., 1999).

The drinking patterns of adolescents

Pattern of drinking may refer to several aspects of drinking behavior, including the types of alcohol beverages consumed, the settings where alcohol drinking takes place, the number of heavy drinking occasions and the number of intoxications (Rehm, Ashley, Room et al., 1996). For this reason, alcohol consumption is a complex, multi-faceted form of behavior.

Lifetime and regular drinking

In most countries where epidemiological data are available, i.e. mainly the industrialized countries, alcohol is a widely known substance which is consumed by minors from the age of 13 or 14 years and even before (Bagnall, 1988 ; Chen & Kandel, 1995 ; Smart & Ogborne, 2000). The European School Survey Project on Alcohol and Drugs

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(ESPAD), which is a European survey performed every four years, makes it possible to compare the main countries in Europe and the USA (Hibell et al., 2000). The survey has confirmed the following:

- An absolute majority (>80%) of 15- to 16-year-old students have consumed alcohol at least once in their lifetime. This figure varies little according to the countries and lies between >95% (Denmark, Greece, Czech Republic, Slovak Republic) and 75 to 80% (Iceland, Italy, France, Portugal, Romania). In the USA, the lifetime prevalence is below that observed in most European countries, with 71% of 15- to 16-year-olds having drunk alcohol at least once in their lifetime.
- Although most youngsters have already consumed alcohol, regular consumption only concerns a minority of adolescents. For example, the ESPAD 1999 survey found that the use of any alcoholic beverage 10 times or more during the last 30 days concerned less than 20% of 15- to 16-year-olds. Contrary to lifetime prevalence, drinking 10 times or more during the last 30 days varied significantly from one country to another. The highest figures were found in the UK (16%), Ireland (16%) and Denmark (18%), and the lowest in Norway (3%), Sweden (2%), and Finland (1%). The Mediterranean countries including France (8%), Portugal (6%) and Italy (7%) were situated near the mean, as was the United States (5%).
- The quantity of alcohol consumed also differs from one country to another. When one calculates the estimated average consumption of beer, wine and spirits in centiliters (cl) of pure alcohol on the last drinking occasion (a figure that may be considered as an estimation of global alcohol consumption), it is 5.6 cl in Europe. Contrary to expectations, the adolescents of the “wet” drinking countries consume on average less than those of the “dry” drinking countries. For example, 15-to-16 year olds in Denmark, Ireland and Greenland consume about 10.0 cl, whereas those of countries such as France, Portugal, Italy and Greece consume between 5.0 and 7.0 cl.

Data from the developing world are heterogeneous regarding to age, sample size, scholar status and consumption criteria. As far as lifetime consumption is concerned (World Health Organization, 2003), some countries, e.g. China and Venezuela, are quite similar to the US. But most of developing countries have lower lifetime consumption rates: 39% among 12-17 old adolescents in Bolivia had consumed alcohol at least once (1996), 35% in Brazil (1999), 50% in Costa Rica (1995), 41% in Nicaragua (1994), 41% in Republic of Korea (1987), 30% in South Africa (1998), 54% in Mexico (1993) and 40% in Zimbabwe (1996). It is even lower (but not zero) in Moslem countries as Egypt (23% of a secondary school sample, 100% boys had consumed alcohol at least once during their lifetime, in 1987), Morocco (25% of medical students, 65% males, in 1990), Senegal (22% in a national upper level secondary school sample, most males, in 1999) or Malaysia (8% of secondary school people in 1986).

Drunkenness and binge drinking

Drunkenness may be considered either as part of a drinking pattern or as a consequence of drinking (Single & Leino, 1998). Owing to its more subjective nature since it is difficult to know what criteria a person will use to declare that he/she is drunk, this “mode of drinking” has been less studied in the epidemiological surveys and no data are available for developing countries. However, it would seem clear that in adolescents, studying drunkenness is at least as important as evaluating the quality of alcohol consumed (Forsyth & Barnard, 2000). At this age, drunkenness is the cause of road accidents (both as driver, passenger, or pedestrian), especially when drunkenness is accompanied by lack of experience. It is only since 1991 that the Monitoring the Future survey has included drunkenness in its battery of questions. As regards the ESPAD survey, six questions concern drunkenness: lifetime, last 12 months and last 30 days prevalence of drunkenness; 10-point scale of last drunkenness; number of glasses needed to get drunk (Hibell et al., 2000). According to that survey:

- In the large majority of European countries, more than half of 16-year-olds have been drunk at least once in their lifetime. The largest proportions are found in Denmark (89%) and in the Scandinavian countries, in the UK and Ireland (between 70% and 80%). The Mediterranean countries have relatively smaller proportions (<50%), whereas most countries in the East are situated between these two extremes. The prevalence observed among 15- to 16-year-olds in the United States is close to that observed in Mediterranean countries.
- In terms of frequency of drunkenness (defined as at least three periods of drunkenness during the last 30 days), the order is Denmark (30%) followed by the Anglo-Saxon countries (between 24 and 27%), then the

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Scandinavian countries (between 14 and 18%). Like the USA, the Mediterranean countries have much lower proportions (<7%). Most Eastern countries are situated between these two extremes.

- Another measure related to alcohol intoxication is the frequency of having five or more drinks in a row (binge drinking). The proportion indicating any such consumption during the last 30 days varies considerably from one country to another. This behavior is more common among countries with high drunkenness levels and less common among those with low drunkenness levels, thus suggesting that binge drinking and intoxication drinking (or drunkenness) are very similar forms of behavior.

Modeling drinking patterns

By applying the frequency of consumption (10 times or more during the last 30 days) and the frequency of drunkenness (three times or more during the last 30 days), IREB³ 2002 established four models of consumption in Europe:

- Model 1: countries with “frequent alcohol consumption and repeated intoxication”. These are the countries where 15- to16-year-olds are already “heavy” alcohol consumers. These countries include Denmark, the United Kingdom, Ireland, the Netherlands, the Czech Republic and Lithuania;
- Model 2: countries with “frequent alcohol consumption and little intoxication”. These are the countries where regular alcohol consumption is predominant from the age of 15 to 16 years. They include Malta, Greece, Cyprus and France;
- Model 3: countries with “occasional consumption and repeated intoxication”. In these countries, alcohol is consumed in a dependent manner by 15- to16-year-olds. Such countries are Sweden, Norway, Finland and Iceland;
- Model 4: countries with “occasional consumption and little intoxication”. These are countries such as Italy and Portugal where alcohol consumption is low. In the United States, 15- to16-year-olds are close to this model.

In view of this classification, the youngsters the most at risk with regard to alcohol (defined as those whose consumption and quest for drunkenness exceeds the thresholds indicated) do not come from those countries where total consumption of alcoholic beverages is the highest. For example, adolescents in France and Portugal, the countries where alcohol consumption is the highest in Europe, have a rather moderate consumption. On the other hand, adolescents in Denmark, Ireland and the United Kingdom, countries that do not lead Europe in terms of overall consumption, have a very high level of alcohol use among youngsters. It is likely that in all these countries, the model of adult consumption is adopted around the age of 20 years, i.e. at the moment of joining the labor market (Arvers & Choquet, 1999). Even so, the official consumption data in the form in which they are published annually do not make it possible to estimate the consumption of adolescents, for whom specific surveys are required (Smart & Ogborne, 2000).

The changing drinking pattern

Changes in alcohol consumption over time are often mentioned whenever adolescent drinking is discussed. Yet there are many methodological problems involved in making comparisons over time, such as the comparability of samples and questions. According to the official statistics, the consumption of alcohol has decreased over the last 30 years in Mediterranean countries, whereas in other countries such as the North of Europe, it is increasing. However, no systematic statistics are available to regularly follow adolescent consumption, apart from the major North American surveys such as Monitoring the Future (Johnston et al., 2001) or the European surveys such as ESPAD (Hibell et al., 2000) or HBSC (Currie et al., 2000).

Comparison of two successive ESPAD surveys (1995 and 1999) has shown that regular consumption of alcohol among 15- to16-year-olds in Europe, together with binge drinking, is increasing particularly in the Eastern countries, in certain Scandinavian countries such as Norway and Denmark, and in the United Kingdom and Ireland. The Finnish data over 20 years confirm this tendency (Lintonen et al., 2000). On the other hand, consumption is clearly decreasing in Italy and Cyprus. Although France was not part of the ESPAD survey in 1995, the results of the two IREB surveys (in press) confirm this decreasing tendency. Similar results have been obtained for Greece (Kokkevi et al., 2000) and Spain (Vives et al., 2000).

³ Institute de Recherche sur les Boissons (IREB)

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These differential tendencies according to countries are accentuating drinking patterns, as they have been defined by the IREB (2002). In effect, adolescent consumption has increased in the six countries with “frequent alcohol consumption and repeated intoxication”, while in those with “occasional consumption and little intoxication,” it has decreased (e.g. in Italy, Greece and France) or remained stable (e.g. Portugal). With regard to the United States whose level of consumption is close to that of the Mediterranean countries, alcohol consumption remains stable or tends to decrease slightly (Johnston et al., 2001). Therefore, contrary to expectations, general levels of consumption in adolescents are not stabilizing across the board. For this reason, it is important to study alcohol consumption within its social and cultural dimensions (Engels & Knibbe, 2000).

Preferred beverages

Beer and spirits are the preferred beverages of adolescents whereas among adults, the popularity of beverages varies considerably between countries (Engels & Knibbe, 2000). In Europe, beer and strong alcohol is clearly preferred to wine, even in the countries where wine is a traditional beverage, e.g. in Italy, France and Portugal (Engels & Knibbe, 2000). Even in developing countries, beer is growing rapidly in its popularity among youngsters. Thus, adolescents are now contributing largely to the internationalization of alcoholic beverages and to the progressive abandonment of national products (Single & Leino, 1998). This is particularly the case for the Mediterranean countries like France and Italy where the consumption of wine is decreasing in adolescents, whereas this beverage (in particular, the good quality wine) is associated with “eating well,” a cultural value much appreciated by adults (Arvers & Choquet, 1999).

Drinking motivations and drinking locations

The main motivations for drinking are either personal (e.g. to forget one’s problems) or social (e.g. to be sociable, to facilitate social interaction, to overcome one’s timidity with the opposite sex). It is the personal type of motivation that leads to the development of “problem drinkers” who are inclined to drink more than the “social drinkers” (Prendergast, 1994). Problem drinkers are also characterized by having numerous personal and family problems (Rodondi, Narring & Michaud 2000). However, the ESPAD survey has shown that the two types of motivations are correlated and not complementary. In fact, in countries where the “forget my problems” drinking motivation is greater than elsewhere, e.g. Denmark, Ireland and the UK, the drinking motivations “feel more friendly and outgoing” or “have a lot of fun” are also the greatest. It is as if the more one drinks, the more one finds various reasons for drinking, and vice versa. This lends weight to the hypothesis made by Aas et al., (1998) according to which expectations are predictive of the onset of alcohol abuse, which in turn increases the expectations.

Another approach to the circumstances of drinking is to ask youngsters in what conditions they drink more alcoholic beverages than usual. In France, more than 80% of youngsters (boys and girls) increase their consumption of alcohol during festive moments such as gatherings of family or friends, whereas fewer than 5% do so whenever they have personal problems (Choquet & Ledoux, 1994). This confirms the social role of alcohol in France.

With regard to preferred locations, Fortsyth & Barnard (2000) have drawn attention to the link between drinking occasions, drinking style, and risk. According to these authors, much drinking tends to take place within the family home, usually under parental supervision (low-risk drinking), while alcohol consumption may take place in a variety of public or “hidden” outdoor locations (high-risk settings). Between 13 and 19 years of age, young people move from a family mode of consumption to consumption between peers (IREB, in press; Aas et al., 1998), where the greatest risks are intoxication, illicit drug use and associated delinquency.

Recent debate has concerned the link between sports practice and alcohol consumption. Although the “third half-time” of sports competitions is often an occasion to drink and even to get drunk, it is customary to advocate sports practice as a means of preventing alcohol consumption (Waddington, 2000). However, it has been demonstrated that young people who practice a sport, especially those who do at least eight hours per week or participate in competitions, are more at risk of regularly consuming alcohol than others (Choquet & Arvers, 2002).

And the positive effects of drinking?

Most epidemiological studies have examined in detail the regular consumption of alcohol or drinking to get drunk, because both of these forms of behavior may eventually lead to accidents or to more chronic disorders. However, it is

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also necessary to study the positive effects of drinking among adolescents, particularly that of moderate consumption, which has been studied very little to date.

Pleasure and sociability are an integral part of the occasional consumption of alcohol and in most cultures, drinking is an integral part of or adjunct to celebration. Even “competitive drinking” (Heath, 1999) forms part of the social life of young people in many countries, which is a sign that adolescent drinking should not only be interpreted in terms of risks and negative effects (Engels & Knibbe, 2000). “Feeling relaxed”, “feeling happy”, “feeling more friendly and outgoing”, “having a lot of fun” are among the positive effects which may be mentioned (Hibell et al., 2000). Engels & Knibbe (2000) also emphasize that boys and girls at the age 15 who drink more frequently at parties or at public drinking experience less loneliness and are more likely to have a larger number of friends, to have a best friend and to have a partner. However, it is clear that epidemiologists are more inclined to examine the pathological side of drinking (and the risk factors) than the positive health effects (and factors of protection), which explains why there is a lack of information about the positive effects of drinking during adolescence.

A comprehensive approach to adolescent drinking

Socio-demographic data

Gender influences drinking behavior and its effects (Wilsnack & Wilsnack, 1997) and in most countries all over the world (including developing countries), men continue to drink more than women. However, data collected in the USA during the 1970s began to indicate that the gender differential is disappearing, a finding leading to the “convergence hypothesis” (White & Huselid, 1997). The gap between the genders still remains in Europe, even if it is greater in the Mediterranean and Eastern countries (where the sex ratio is at least 2.0) than in the Northern or Anglo-Saxon countries (where the sex ratio is about 1.2) (Hibell et al., 2000). In France, studies have shown that the difference between boys and girls persists over time and increases in relation to lifetime prevalence (sex ratio (SR) = 1.2), regular consumption (SR = 3.0) or daily consumption (SR = 4.5) (Arvers & Choquet 1999, Choquet & Ledoux, 1994). The “gender gap” also exists in most developing countries, and is very high when regular use is considered (in Korea, SR = 11,2; in India, SR = 8,4; in Costa Rica, SR = 20,0; in Malaysia, SR = 4,4).

The most constant finding, which has been reported in all the national and international studies, is the constant increase in consumption with age, whether it is regular consumption, drunkenness or binge drinking. Thus, between 11 and 19 years of age, alcohol consumption increases substantially, and this increase concerns all young people (Currie et al., 2000) and all countries, even those where the overall level of consumption has decreased from one period to another (Kokkevi et al., 2000). According to Lintonen et al. (2000), the increase in consumption with age has been greater for the young generation born in the 1980s than for those born between 1962 to 1966.

However, there is an interaction between gender and age. For example, the increase in consumption in age is greater in boys than in girls (White & Huselid, 1997; Choquet, Ledoux & Hassler, 2001), so the sex ratio increases with age. In the USA (White & Huselid, 1997), the sex ratio between grade 8 and grade 12 increased from 2.3 to 3.3 for daily use and from 1.2 to 1.8 for five drinks per occasion during the last two weeks. In France, (Choquet, Ledoux & Hassler, 2001), the sex ratio between 14 and 18 years of age increased from 1.5 to 2.9 for regular consumption and from 2.6 to 4.1 for repeated drunkenness. All these data point to young people progressively adapting to the male and female adult models of consumption.

Alcohol is often consumed early in life and almost half of all girls and boys have already drunk at least one alcoholic beverage before the age of 13 (Hibell et al. 2000; Bailly et al. 1993) or before grade 8 (White & Huselid, 1997; Bagnall, 1988). Drunkenness or binge drinking appear later, and in general there is a period of two years between the first consumption of alcohol and the first episode of drunkenness. The proportion of adolescents who have been drunk at the age of 13 or younger varies quite substantially between countries. Not surprisingly, the largest proportion of adolescents who have an early experience of drunkenness is found in high-prevalence areas (Hibell et al., 2000) such as the Scandinavian and Anglo-Saxon countries.

With regard to socio-economic status and level of parents’ education (in most studies, no distinction is made between the status of the father and mother and only that of the head of the family is known), there is a wide consensus regarding their weak influence on the level of consumption of their children (Lewinsohn, Rohde & Seeley, 1996; Schucksmith, Glendinning & Hendry, 1997; Casswell et al., 1991; Duncan, Duncan & Hops, 1994). Unexpectedly,

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recent data have demonstrated excessive alcohol consumption in socially privileged families (Leveque et al. 2002; Epstein et al., 1999; IREB, in press). This seems to point to a change in the social context of alcohol abuse. Epstein (1999) even suggests that being in a lower socio-economic group is an economic barrier to more regular use.

The impact of parental separation on alcohol consumption has been studied much more than the effect of other family factors such as the socio-economic status of parents and their level of education. In both longitudinal and cross-sectional surveys, divorce of parents and single parenthood are associated with alcohol abuse in youngsters (Ledoux et al., 2000). Surprisingly, however, some authors have found this association only in girls (Epstein et al., 1999) while others suggest that it varies from country to country (Ledoux et al., 2002). Yet the most striking finding in terms of the family is that living with both parents is a less robust barrier to substance abuse than qualitative aspects of family life, particularly attachment to one's mother (McArdle et al., 2002).

Parental and peer influence

The influence of peers on adolescent alcohol consumption has been widely studied, because affiliation with user peers is predictive of alcohol abuse (Fergusson, Horwood & Lynskey, 1995). Moreover, peer pressure has an impact on the beginning of alcohol use (Duncan, Duncan & Hops, 1994) and peer approval seems to be more important than parental approval (Connolly et al., 1992). Youngsters affiliated with peers who practiced and encouraged substance abuse developed more positive prototypes of drinking, and this social image in turn predicted subsequent drinking (Blanton et al., 1997). Schulenberg et al. (1999) defined two factors that interact in adolescent drinking, i.e. exposure to peers (environmental factor) and susceptibility to peer influence (personal factor). It would seem that the former has no effect on alcohol consumption if the latter is high. In a longitudinal study, Costa et al. (1999) showed that psycho-social risk factors such as having friends as a consumer model are powerful predictors of the development of problems associated with alcohol consumption, even if protective factors (especially familial) moderate these effects. Even so, Engels et al. (1999) found that perception of best-friend consumption had virtually no effect on adolescents' behavior over time.

The influence of parents has been demonstrated many times. In 1981, Glynn concluded that parental consumption was the most important factor explaining the initiation of their children. However, there would seem to be a gender difference, girls being more sensitive to parental influence than boys are, while the latter are more sensitive to the influence of their peers (Pedersen & Skrondal, 1998). This parental influence may intervene early since Griesler & Kandel (1998) showed that prenatal maternal drinking had a positive effect only on daughters' current drinking. Yet beyond parental consumption, it is variables concerning the family atmosphere that are more involved, such as family cohesion (Denton & Kampfe, 1994), parental supervision and confidence in one's mother (confidence in one's father having a weaker effect) (McArdle et al., 2002). These parenting factors are important predictors for all adolescents whatever their ethnic or social origin (Barnes, Farrell & Banerjee, 1995). However, adolescents are more likely to base their behavior with regard to alcohol on that of their parents if they enjoy good relationships with them than if their relationships are poor (Andrews, Hops & Duncan, 1997). This may explain why no significant relationship has been found between a family history of alcoholism and problems of alcohol abuse in young people (Barnow et al. 2002, Blanton et al. 1997). The results of the IREB survey (IREB, in press) could be interpreted in this light, because it found that the fact of having several people frequently drunk in one's entourage significantly decreased (OR = 0.1) the risk of alcohol consumption in girls.

Family versus peer influence has also been investigated. Although Potvin & Lee (1980) stated that "peers replace parents as generating and influencing alcohol use", the issue is more complex. Sutherland & Shepherd (2001) suggest that some adolescents are more influenced by their peers than others are and that peer-influenced adolescents drink alcohol more regularly than family-focused adolescents. However, recent work has found that peer influence is not independent but appears to be a function of family conditions, so family conflict increases involvement with alcohol-using peers and therefore leads to more self-reported use (Baer & Bray, 1999). Even so, peer influence is stronger than that of the family when substances are perceived to be of relatively minor importance and family influence is stronger when more harmful substances are considered (Sutherland & Shepherd, 2001). Therefore, with regard to the cultural value of alcohol consumption and the fact that in some cultures it is perceived as more harmful than in others, this result suggests that peer versus family influence can be quite different from one culture to another.

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Associated problem behavior

There is a strong correlation between the consumption of alcohol, tobacco and cannabis. Alcohol consumers are more likely to smoke tobacco (OR=3.7) and cannabis (OR=5.0) than non-consumers (Choquet, Ledoux & Hassler, 2001). However, the association “alcohol-cannabis” is greater for girls than for boys (OR=3.2 for boys and 8.3 for girls), thus suggesting a gender-related difference. Yet the nature of this link is not clear and the question is whether this relationship is causal, as suggested by the “gateway theory”. This theory states that young people tend to start using alcohol or tobacco and then may progress to marijuana and finally to hard drugs (Kandel, 1975). Golub & Johnston (2001) show that the gateway theory appears to be unreliable, the probabilities of progression between stages having shifted dramatically across birth cohorts. Their findings also suggest that the gateway phenomenon reflects norms prevailing among use at a specific place and time, and that simply restricting youth access to gateway drugs will not necessarily reduce subsequent hard drug use. Moreover, longitudinal studies (Wills et al., 1996) have not confirmed this causal link, because a subgroup of high-risk adolescents with rapid escalation of substance use can be identified within the general population, together with a larger group who show a minimal level of use over time. This “high-risk group” is characterized by greater life stress, lower parental support, more parental substance use, more deviant attitudes and mal-adapted coping, lower self-control ability and greater affiliation with peers who use substances.

Alcohol users tend to have more problem behaviors than non-alcohol users, especially school behavior (missing school, late to class) (McBroom, 1994) and violent behavior (delinquency, aggressiveness). On the basis of a literature review, White (1997) concluded that aggressive behavior is more predictive of alcohol consumption than vice-versa. Attention disorders during childhood (e.g. hyperactivity) also herald subsequent alcohol consumption (Masse & Tremblay, 1997). Rossow et al. (1999) confirm that there is a small direct effect of alcohol intoxication on violent behavior and that a large proportion of the co-variation in drinking and violence could be attributed to involvement in other problem behaviors. Even so, the persistence of delinquency is strongly associated with the persistence of consumption (Loeber, Stouthamer-Loeber & White, 1999), hence the need for a global prevention policy that is not focused on the product or the behavior but on the social integration of individuals.

Associated emotional problems

The co-morbidity between consumption, which may be excessive, and emotional disorders such as depression, anxiety and suicide attempts has often been underlined (Windle & Windle, 1997), even if research in young people has emphasized the link between alcohol consumption and antisocial behavior. In population-based surveys, the link between suicide attempts and alcohol consumption has been found in adolescents but only for “problem drinkers” (OR=1.9) (Rodondi, Narring & Michaud, 2000, Prendergast, 1994) and only in girls (Pulkkonen & Pitkanen, 1994; IREB, in press). Using data obtained in clinical populations, some authors have suggested (Pirkola et al., 1999) and even claimed (Fombonne, 1998) a causal link between alcohol misuse and suicide. However, in longitudinal studies, the predictive nature of these disorders on consumption has not always been confirmed (Boyle et al., 1992), a finding which does not lend weight to a causal hypothesis. On the other hand, it is widely admitted that high-risk youngsters cumulate emotional disorders and alcohol misuse, that depressed or suicidal adolescents use alcohol as a means (not always successful) of decreasing stress and intolerable affects (Cooper et al., 1995), and that girls are more likely to cumulate these disorders than boys (Windle & Windle, 1997, IREB 2002).

When youngsters are in a situation where their behavior is subject to real or imagined scrutiny by others, there would seem to be a clear relationship between social anxiety and heavy drinking. There is some evidence that in social situations involving drinking, feelings of social anxiety serve to activate alcohol expectancies of social facilitation and social anxiety reduction (Burke & Stephens, 1999).

Conclusions

The methods for measuring consumption vary greatly and cannot be compared from one study to another or from one social context to another (Bloomfield et al., 1999). Clearly, this is because alcohol consumption is very complex, involving different beverages, modes, situations, and levels of consumption, not to mention intercultural differences. Hence, there is a need for international criteria so that results may be compared while cultural differences are respected.

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Surveys have shown that adolescents consume less than adults on average (Deas et al., 2000). In addition, adolescent consumers are more numerous and they consume more regularly and get drunk more frequently in the Anglo-Saxon countries, with the exception of the USA, and in certain Scandinavian countries (particularly, in Denmark) than in the alcohol-producing nations, such as Italy, Greece, Portugal, and France. Moreover, in the countries of the first group, consumption tends to increase over time while it tends to decrease in the second group. This suggests that protection against underage alcohol consumption is greater in the “wet” countries than in the “dry” countries. Curiously, the level of adolescent consumption in the USA is close to that of the wet nations, the countries of Eastern Europe, and lies between that of the wet and dry countries. Most developing countries, especially the Muslim countries, exhibit lower rates of underage alcohol consumption than those of the developed world. However, beer and spirits are becoming the global favorite beverages of youngsters, who are now abandoning some of their national beverages. Increasingly, the official statistics for consumption (or production) do not provide an overall picture of alcohol consumption between the ages of 10 and 19. Therefore, there is a need for specific comparative surveys in young people.

Although consumption increases with age in all countries, there is a wide variability with regard to the differences between boys and girls. The gender gap persists in some areas, particularly in the wet and developing countries, but is narrowing or even disappearing in others, as in the Anglo-Saxon countries. However, there is a difference between boys and girls not only with regard to levels of consumption, but also in prevalence and incidence rates. In effect, several authors have underlined various associations, or levels of intensity, for girls and boys. Such is the case for the link between alcohol and cannabis, which is greater for girls than for boys, or the link between alcohol and emotional problems, which has been suggested for girls but not boys. This suggests a model of consumption that differs according to gender. This gender hypothesis remains to be investigated in detail, particularly with regard to different cultures. Therefore, systematic analytical research based on gender is required.

Other factors also seem to play a different role from country to country. This is the case for divorce of parents and their social level, which according to the studies, may or may not constitute a risk factor. It is likely that a number of incoherences between these findings are partially to be explained by cultural differences. However, as most of the research published comes from North America or Australia, the scientific community is still not in a position to perceive this cultural dimension in the reported data. For this reason, the wet countries and developing countries should more readily publish their findings and favor intercultural research, in both Europe and elsewhere.

Epidemiological surveys have inherent problems. They attempt to explain potentially pathological behavior mainly by analyzing regular or harmful consumption. However, since occasional and moderate consumption is still the most prevalent model in young people, with only a minority consuming regularly, it would be useful in a prevention perspective to study the factors that allow it to remain so. Hence, the need is to develop epidemiological research on the cultural, social, and personal factors that allow an individual to remain a moderate consumer.

Yet beyond the knowledge of how young people consume alcohol, public policy should be based on continuing observation of the rich and changing context in which young people use substances (Golub & Johnston, 2001). We should therefore promote descriptive and analytical surveys that are repeated, and then conclude about their practical implications.

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Biomedical Aspects of Underage Drinking

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Introduction

In this section, a biomedical approach will be used to examine the questions of why adolescents typically begin to use alcohol, why some engage in high levels of use, and what are the consequences of this use.

Data from human adolescents will be discussed where possible, and will be supplemented by experiments in laboratory animals using models of adolescence based on across-species similarities in developmental history (Spear, 2000). As discussed below, the brain goes through dramatic transformations during adolescence in a variety of brain areas. These transformations are associated with apparent changes in the sensitivity of adolescents to various alcohol effects. Adolescents differ from adults in alcohol adaptations as well, including the propensity to develop tolerance and dependence and to display withdrawal. Implications of alcohol use at this time of rapid change will be considered: there is evidence that early exposure to ethanol predicts later alcohol problems and that high levels of alcohol consumption are associated with neural and cognitive dysfunction. Whether either association is causal or merely reflects predisposing risk factors is discussed, and considered along with appropriate data from laboratory animals. This section closes with a discussion of other risk factors, including the contribution of genetics, family history of alcoholism, fetal alcohol exposure, environmental stress, and their interactions to the predisposition of adolescents to develop alcohol-related problems.

The adolescent brain and alcohol

Brain development is a life-long process during which life experiences modify brain microstructure and function (Greenough et al., 1999), and occasional new brain cells (neurons) are formed even in adult animals (van Praag et al., 2002). But after the period of rapid brain growth before birth and during infancy, the pace of brain changes is modest, with one exception: the dramatic transformations of adolescence. During adolescence, the brain undergoes a metamorphosis, losing up to 50% of the connections between neurons in some brain regions and forming some new connections. Interestingly, to the extent that data are available, similar adolescence-associated brain changes are seen across a variety of species during their transition from immaturity to independence. The magnitude of these neural transformations is immense. It has been estimated that 30,000 connections (or “synapses”) among neurons may be lost *per second* from the outer surface of primate brain during some portions of adolescence (Rakic et al., 1994). As outlined below, this developmental restructuring of the brain may help trigger puberty, increase brain efficiency in terms of energy utilization, and help bring about cognitive development and the behavioral changes typical at this age, including an increased tendency to use alcohol and other drugs.

Sexual maturation, puberty and the hypothalamus.

Some of the changes occurring in adolescent brain may help initiate puberty – that is, the increase in sex hormones, development of secondary sexual characteristics, and other physiological transformations associated with sexual maturation that occur sometime within the broad adolescent period. One brain area thought to be involved is the hypothalamus, a region that is critical for controlling the release of hormones from the pituitary into the blood circulation where they can affect a variety of organs and glands and stimulate release of other hormones (e.g., Apter, 1997; Becu-Villalobos et al., 1997). Through action on pituitary hormones, changes in activity in hypothalamic regions during puberty are thought to stimulate increases in sex hormones, including the release of testosterone from the testes in males and estrogen from the ovaries in females (Styne, 1994). Yet brain changes during adolescence are by no means restricted to the hypothalamus and other brain regions important for controlling the release of sex hormones.

Cortical losses and an adolescent decline in brain energy use.

Particularly pronounced changes are evident in the outer layers of the brain. Almost 50% of the connections among neurons (or “synaptic connections”) in some regions of the cerebral cortex are eliminated during adolescence (Huttenlocher, 1979; Bourgeois et al., 1994). This may be one way by which the relatively inefficient, energy consuming brain of the child becomes chiseled into a leaner, more efficient, less energy consuming mature brain. Indeed, less cortex is activated when adolescents perform a variety of cognitive tasks than when children perform those same tasks (Casey et al., 2000). Concurrently, there is an increase during adolescence in the extent to which left and right cortical regions process information independently (Merola & Liederman, 1985). Presumably in part related to this synaptic pruning, the overall amount of energy utilized by the brain declines from the peak levels reached early in childhood to the lower, adult-typical levels during adolescence (e.g., humans: Chugani, 1996; rats: Tyler & Van Harreveld, 1942; cats: Chugani, 1994). Changes are also evident in the relative size between different brain regions. The cortical “gray matter” (cell body regions) becomes smaller, contrasting with sometimes gender-specific increases in brain regions that lie beneath the cortex (subcortical regions) (Giedd et al., 1997). Indeed, both subcortical and cortical brain regions undergo considerable transformation during adolescence across a variety of species, changes that are particularly dramatic in a group of closely interconnected areas in the front of the brain (forebrain).

Adolescent-associated transformations in forebrain: dopamine, stress, and reward

A cortical region undergoing especially pronounced restructuring during adolescence is the prefrontal cortex (PFC), an area of the cortex located near the front of the brain that is thought to control a variety of functions related to goal-directed behaviors and decision making, as well as the processing of aversive and other emotional stimuli. Developmental transformations in this region during adolescence may be related to enhancements in certain types of cognitive performance that typically emerge during this age span (e.g., Levin et al., 1991). As in other cortical regions, adolescent-associated remodeling in PFC includes both regressive and progressive changes, although the net effect is a decrease in the relative size (volume) of this region during adolescence in humans (Jernigan et al., 1991) and in other species (van Eden et al., 1990). Regressive changes include a substantial loss in synaptic input (e.g., Huttenlocher, 1984). Much of this loss has to do with a decline in connections linked to a particular type of communication chemical (neurotransmitter) called glutamate, one of the major excitatory signals used by the brain (Zecevic et al., 1989). While glutamate declines (Zecevic et al., 1989), input from another neurotransmitter system, dopamine (DA), increases to reach a peak in PFC during adolescence in primates (see Lewis, 1997, for review) and in other species (e.g., rats: Kalsbeek et al., 1988).

Dopamine input to several subcortical regions (striatum, nucleus accumbens, and other mesolimbic regions) also undergoes considerable modification during adolescence (see Spear, 2000, for review and references). These regions are closely interrelated, and developmental alterations in DA input to them has been postulated to cause a shift in DA activity during adolescence (Spear, 2000). This shift in balance would be expected to be further exacerbated by stressors (Dunn, 1988).

Adolescent-associated changes are not restricted to alterations in DA activity in these subcortical regions, with changes also seen in mesolimbic brain regions such as the hippocampus and amygdala (Benes, 1989; Insel et al., 1990). These developmental changes may have pronounced consequences for the adolescent, given the presumed roles of these closely interrelated, stress-sensitive brain regions in affecting a number of critical adolescent behaviors, including social and affective behaviors, novelty seeking and risk-taking (e.g., Le Moal & Simon, 1991). This may be of particular importance since regions undergoing modification during adolescence also form part of the neural circuitry critical for assigning the importance (“incentive salience”) to stimuli, including alcohol and other drugs (e.g., Le Moal & Simon, 1991; Koob et al., 1993).

There are intriguing clues from a variety of sources that developmental changes in the amygdala, an almond-shaped area of the brain, may be particularly critical for the adolescent. The amygdala plays a particularly important role in learning about and the processing of emotional stimuli. For instance, during the assessment of emotions from facial stimuli, the amygdala is activated (Baird et al., 1999). A number of recent imaging studies in humans have found adolescents to differ from adults in the extent of this amygdalar activation during the processing of emotional facial stimuli. At this early stage of investigation, however, no consensus has yet been reached regarding the nature of this change (see Spear, 2003, for discussion). Intriguingly, one of the few cognitive tasks at which younger adolescents

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perform more poorly than children is that of facial recognition (e.g., Carey et al., 1980). Additional indicators of changes in adolescent amygdala have been obtained from work with laboratory animals. For instance, the amygdala of the rat is more sensitive to seizure induction during adolescence than earlier or later (Terasawa & Timiras, 1968). Increases in the ability of stressful stimuli to activate gene expression in rat amygdala have also been reported during adolescence (Kellogg et al., 1998).

Metabolic activity in the amygdala is often inversely related to activity in PFC and other cortical regions (Davidson et al., 1999), suggesting the possibility that stressful or emotional stimuli might alter the relative pattern of activation between the PFC vs. amygdala differently in adolescents than adults. Similar to the adolescent-associated, stress-exacerbated shift in balance of DA activity suggested above between PFC and mesolimbic regions, the developmental changes in relative activity between PFC and amygdala could contribute to the susceptibility of adolescents to stressful and emotional stimuli (Spear, 2003). A functional consequence may be the adolescent tendency to revert to emotionally-biased decision making under stressful circumstances. Dahl (2001) has suggested that stressful/emotional stimuli may predispose adolescents to switch the focus of decision making from “cold cognitions” (logical, rationale thinking evident under low emotion and arousal conditions) to the “hot” cognitions that often characterize adolescent decision making in emotionally-arousing, real-life situations and can lead to high risk behaviors, including the use of alcohol and other drugs.

Do adolescents respond to alcohol the same way as adults?

The brain regions undergoing remodeling during adolescence are very sensitive to the effects of alcohol (Koob et al., 1998). This raises the question whether adolescents vary from adults in their sensitivity to alcohol. This question is difficult to examine in adolescents, particularly in the United States and other countries because of the restrictions imposed by the legal drinking age. Even if such studies were permissible, comparisons across age would be complicated by differences in the amount of prior alcohol exposure, the amount of experience functioning under the influence of alcohol (“intoxicated practice”), and the degree of alcohol tolerance. By contrast, animal models can be easily used to explore these issues. Of course, not all aspects of adolescence can be properly and productively modeled in laboratory animals (see Spear, 2000, for discussion). Animals cannot be used to examine the influence of adolescent self-esteem, parenting styles, and cultural influences on teenage drinking. Even when using animal studies to examine fundamental age differences in ethanol sensitivity, caution is necessary when interpreting results. In studies with laboratory animals, ethanol is often administered via injection or directly into the stomach. While these methods allow for experimental control across age, they are forced and often stressful for the animal. As the result, the absorption and distribution of alcohol to laboratory animals may yield different physiological and behavioral effects compared to human voluntary consumption. Thus, prudence is necessary when exploring implications for human adolescents of data derived from animal models.

Research using laboratory animals has shown adolescents to differ considerably from adults in their initial responsiveness to alcohol. In many respects adolescents are less sensitive to alcohol than more mature individuals. One notable example is the sedative effects of ethanol. When challenged with alcohol for the first time, adolescent rats are considerably less susceptible than adults, and pre-adolescents are even less sensitive than adolescents (Silveri & Spear, 1998). A similar pattern is evident in terms of impaired motor skills after an acute alcohol dosage (Hollstedt et al., 1980). Adolescent rats also appear to require a higher initial amount of alcohol to reduce anxiety than do adults (Varlinskaya & Spear, 2002). Moreover, recent research suggests that adolescent rats may be less sensitive to the “hangover” that follows a single exposure to a high dose of alcohol (Doremus et al., 2002).

To the extent that these experiments provide useful insights for human behavior, a decreased sensitivity to the adverse effects of alcohol that normally serve to moderate drinking in adults (such as sedation, impaired motor skills, and hangovers) would allow relatively higher alcohol consumption among teens. Additionally, a relative insensitivity to certain desired effects of alcohol, such as its relaxing quality, would also foster higher levels of use among adolescents. For example, according to the 2000 Monitoring the Future Study, a greater percentage of 8th and 10th graders reported drinking 5 or more drinks in a row within the past 2 weeks (14.1% and 26.2%, respectively) than the percentages reporting that they had been drunk in the past month (8.3%; 23.5%). Meanwhile, the 12th graders reported nearly equal percentages for both drinking and intoxication measures (30.0% vs. 32.3%). These findings, too, could reflect a relative insensitivity of younger adolescents to the initial intoxicating effects of alcohol (Johnston et al., 2001).

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But adolescents are not less sensitive than adults to all effects of alcohol. Adolescent rats are considerably more receptive to the decrease in social inhibitions induced at low levels of alcohol (Varlinskaya & Spear, 2002). At least in humans, this may foster additional alcohol intake among teens. Young rats before and during adolescence are also considerably more sensitive than adults to alcohol-induced disruptions of brain plasticity, in particular in the mesolimbic region of the hippocampus, a portion of the temporal lobe responsible for the transfer of information into memory (Swartzwelder et al., 1995a,b). Behaviorally, adolescent rats are more disrupted by alcohol than adults when performing a spatial memory task thought to be dependent on this hippocampal function (Markwiese et al., 1998). In humans as well, age-dependent memory impairments caused by alcohol have been reported, with younger post-adolescent individuals (21-24 year olds) showing more alcohol-induced disruption of memory formation than slightly older (25-29 year) respondents (Acheson et al., 1998).

Taken together this combination of developmental peculiarities in alcohol responsiveness seems unfortunate for the young adolescent: a reduced sensitivity to some intoxicating effects may permit and foster greater consumption, yet this exposure may have more adverse effects on brain plasticity and memory processing in adolescents than in more mature individuals.

These differing patterns of alcohol sensitivities may be related to changes in the neural development of underlying systems. For instance, greater sensitivity of adolescents to disruptions in brain plasticity and memory caused by alcohol appears to be linked to greater activity of a certain excitatory communication chemical, glutamate, in hippocampus (Swartzwelder et al., 1995a,b). Attenuated sedative effects of alcohol on adolescents appears to be partially related to developmental immaturity in an inhibitory neurotransmitter system called the gamma-aminobutyric acid (GABA) system (Moy et al., 1998; Silveri & Spear, 2002).

Do adolescents differ from adults in the way that they adapt to alcohol?

Much of the work of the nervous system is to maintain the status quo: to sustain all body functions within normal ranges, to adjust to stimuli that do not have important consequences for the body, and to recover from stress, such as that inflicted by drugs and alcohol. These adaptations generally serve to lessen alcohol sensitivity, bringing about the so-called alcohol “tolerance”. Some of these adaptations begin to occur immediately upon exposure to alcohol, moderating its effects within a single episode of consumption. This within-session tolerance is called “acute tolerance,” and can be illustrated by comparing levels of intoxication at different times during the drinking session. That is, levels of alcohol initially rise as it is absorbed, and then begin to decline as it is metabolized. As the acute tolerance develops, the subject would feel more drunk during the absorption phase than when that same alcohol level is again reached during the declining phase. Expression of acute tolerance in rats changes dramatically with age: pre-adolescents show more acute tolerance to intoxication than adolescents, and adolescents more than adults (Silveri & Spear, 1998). This almost immediate attenuation in alcohol effects during a given exposure period seems to contribute in part to the relative insensitivity of younger organisms to alcohol (Silveri & Spear, submitted).

Given that adolescents are less sensitive to a number of alcohol effects, there may be less of a driving force to encourage more long-term neural adaptations resulting in rapid tolerance (a reduction in alcohol sensitivity for a day or so following initial alcohol exposure) and chronic tolerance (tolerance that emerges after a history of chronic alcohol use). Indeed, following a similar history of ethanol exposure across age, adolescent rats have been observed to develop less rapid (Silveri & Spear, 1999) and chronic (Lagerspetz, 1972) tolerance than their adult counterparts. This is not always the case, however, with for instance adolescent rats reported to develop more chronic tolerance to alcohol-induced hypothermia than adults (Swartzwelder et al., 1998). When younger animals are given higher doses of alcohol so that they are as impaired behaviorally as adult animals, few notable differences in ethanol tolerance are seen across age (Silveri & Spear, 2000). Thus, adolescents appear to be capable of developing longer-term forms of alcohol tolerance, at least when exposed to doses sufficient to induce impairment.

Similar well-controlled experiments to examine the development of alcohol tolerance would be difficult to conduct in human adolescents given ethical constraints on exposing children and teens to ethanol on one occasion, let alone repeatedly. Nevertheless, useful data may be obtained when comparing self-reported symptoms from individuals of different ages with alcohol use disorders. Indeed, such studies have observed that adolescent drinkers do report symptoms of alcohol tolerance (i.e., the need to consume more to obtain the same effect) (Martin & Winters, 1998; Chung et al., 2002), perhaps even more commonly than do adults (Deas et al., 2000). Interpretation of age

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differences in reports of tolerance is complicated by possible age variation in initial amount consumed (see Chung et al., 2001) or initial sensitivity to alcohol.

Developing tolerance to alcohol is closely related to addiction, and is included as one of the symptoms of alcohol dependence listed in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). Another traditional measure of dependence is the presence of withdrawal signs, a symptom that is also included in the DSM-IV. Yet, in contrast to common reports of alcohol tolerance, adolescents have been found in most studies to report few if any signs of withdrawal (Martin & Winters, 1998; Chung et al., 2002; but see also Deas et al., 2000). As discussed previously, adolescent rodents likewise show little indication of the acute withdrawal reaction, or the “hangover” effect, that is seen in mature animals after a high dose of alcohol (Doremus et al., 2002). Based on signs of dependence other than withdrawal, however, a number of studies have concluded that teens develop alcohol addiction faster than adults (Deas et al., 2000) and show higher rates of ethanol dependence than more mature individuals (Farrell et al., 2001; Wagner & Anthony, 2002). Thus, the traditional DSM-IV criteria for alcohol dependency based on adults may not be readily applied to adolescents, since the latter show few withdrawal symptoms but develop tolerance and physical signs of addiction at lower levels of alcohol than the more mature individuals. Development of tolerance in teens with a history of alcohol use would encourage even higher levels of drinking, further increasing the probability of dependence. More work is needed to disentangle the relationships between tolerance, withdrawal and dependency during adolescence, research that could benefit from systematic examination of these variables in studies on laboratory animals.

Are there consequences of adolescent alcohol exposure?

Early exposure effect

Many of the brain regions undergoing metamorphosis during adolescence are sensitive to alcohol (Koob et al., 1998). Thus, it is possible that early alcohol exposure might have a lasting influence on an adolescent brain. With some notable exceptions (Labouvie et al., 1997), numerous studies have shown that the earlier the onset of alcohol use among adolescents or even pre-adolescents, the greater the probability of later problem drinking and addiction to alcohol (e.g., Fergusson et al., 1994; Grant & Dawson, 1997; Hawkins et al., 1997; Guo et al., 2000; Grant et al., 2001) and other drugs (e.g., Robins & McEvoy, 1990). The controversy is whether to deem this association of early use with later abuse to be causal, i.e., whether this early exposure to alcohol induces changes in the brain that increase later abuse potential. Whereas some researchers found direct connections between early alcohol exposure and later abuse (e.g., see Hawkins et al., 1997), others have concluded that early drinking serves as a marker rather than a precursor of later addiction (Prescott & Kendler, 1999; McGue et al., 2001). As an example of the latter, high novelty seeking among pre- to early-adolescent youth has been shown not only to predict problem drinking at 27 years of age (Cloninger, 1987) but also early initiation of alcohol/drug use (Baumrind, 1987). Thus, in this case early alcohol use appears to serve more as a marker of the underlying trait of high novelty seeking (itself predictive of later problematic drinking) than as a causal factor leading to later alcohol problems. In short, there is disagreement as to whether it is this early exposure that itself precipitates later problem drinking.

The association between age of alcohol exposure and later consequences for voluntary consumption can be directly explored in experiments with laboratory animals. Yet relevant work is limited, and the available data are conflicting. Some studies report that alcohol experience either during the pre-adolescent or adolescent period increases later drinking (Hayashi & Tadokoro, 1985; Ho et al., 1989); others see no causal connection (Kakihana & McClearn, 1963; Parisella & Pritham, 1964; Tolliver & Samson, 1991). As may likely be the case in humans as well, consequences of early alcohol exposure may depend on the circumstances under which the drinking occurred.

Brain damage from alcohol?

Alcohol exposure during a time of rapid brain development may have an impact on neurobehavioral function beyond the potential to influence later consumption patterns. For instance, adolescents with a history of extensive alcohol use have been reported to have a smaller hippocampus, a brain region critical for converting information into memory (De Bellis et al., 2000), as well as reduced brain activation during memory tasks (Tapert et al., 2001), memory deficits and other neuropsychological impairments (Brown et al., 2000). The brains of adolescent heavy alcohol drinkers also differ from those of other adolescents in the way they respond to alcohol-related stimuli. When shown images of alcohol, adolescents with drinking disorders showed considerably more brain activation (measured by

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blood oxygen use in limbic and frontal brain areas) than other adolescents, with levels of activation being particularly pronounced in individuals reporting high craving for alcohol (Cheung et al., 2001).

The above studies were conducted in adolescents that already had a substantial history of alcohol use. It is, therefore, difficult to determine whether these deficits resulted from the alcohol use, or whether they existed before and perhaps even contributed to the tendency to use alcohol excessively. To address this issue, recent studies have begun to use a prospective approach whereby individuals deemed at high risk for problem drinking are observed, but prior to the age that they begin alcohol use. For instance, adolescents with strong family history of alcoholism were found to have a significantly smaller right amygdala than other individuals, a brain region that plays a significant part in emotion and cognition. This effect that was apparent prior to beginning alcohol use and hence may reflect a neurological risk factor (Hill et al., 2001). No indication of altered size of hippocampus was observed in this sample. This suggests that the report of smaller hippocampal size in adolescents with a history of alcohol use (De Bellis et al., 2000) may reflect the damage inflicted by alcohol, a possibility that will need confirmation in long-term prospective studies of at-risk adolescents both before and after they begin to drink heavily.

Work in laboratory animals provides convincing evidence that adolescent exposure to ethanol can influence later neurobehavioral function. For instance, alcohol exposure during adolescence has been shown to result in long-term disruptions in brain electrical activity in the hippocampus and other brain areas of adult animals (Slawecki et al., 2001). Voluntary alcohol consumption during adolescence has been reported to increase later aggressive behavior in male hamsters (Ferris et al., 1998; Shtiegman et al., 1997). Yet in both of these studies, no adult exposure comparison groups were included, thus it is not yet known if similar effects would be seen after equivalent alcohol exposure in adulthood. In several other experiments, however, adolescent exposures were compared with equivalent alcohol exposure in adulthood, and consequences were found to be more severe following the adolescent exposure. For instance, following 4 days of consuming relatively high amounts of alcohol, adolescent rats were found to have substantially more ethanol-induced brain damage in a number of frontal brain regions (including the PFC) than similarly treated adults (Crews et al., 2000). After chronic alcohol exposure during adolescence, rats have been reported to exhibit greater cognitive disruptions and a greater sensitivity to later ethanol-induced memory disruptions than animals receiving equivalent exposure in adulthood (Osborne & Butler, 1983; White et al., 2000).

Thus, although limited in number, studies conducted in both clinical populations and laboratory animals paint a reasonably consistent picture of an adolescent brain that is unusually sensitive to disruption by chronic alcohol exposure – much more so than the more mature, adult brain. These neurocognitive studies, however, have largely focused to date on clinical populations and high amounts of chronic alcohol consumption. In one study focusing on a non-clinical sample, little direct relationship was observed between drinking behaviors and cognitive performance among the sample of 18-24 year olds (Bates & Tracy, 1990). Thus, while the adolescent appears to be unusually sensitive to long-term brain disturbance following high levels of alcohol use, it remains to be determined as to whether age-specific neuropsychological consequences of alcohol use would be seen following more moderate drinking. This largely unexplored question is an important area of future research.

Predisposing factors for problem drinking

Genetics

An important risk factor for the development of alcoholism and other alcohol problems is a family history of alcoholism. For instance, sons of alcoholic fathers are 3-5 times more likely to become alcoholic than males whose fathers are not alcoholic (e.g., see Newlin & Thomson, 1990). Although a number of factors contribute to this increased probability, genetics plays a clear role. Selective breeding studies in laboratory animals have generated lines of animals that display unusually high or low levels of voluntary alcohol consumption (see McBride & Li, 1998), or exhibit very different sensitivity to a variety of alcohol effects from sedation to intensity of hangover (see Crabbe et al., 1994, for review). These studies have shown that amount of voluntary alcohol consumption as well as sensitivity to various effects can all be dramatically influenced by genetic background. Interestingly, genetic differences in alcohol intake between selectively bred lines of animals are evident not only in adulthood, but during adolescence as well (McKinzie et al., 1999), suggesting the possibility that genetic factors may influence both the emergence of alcohol drinking in adolescence as well as problem drinking in adulthood. Genomic mapping studies have been used to explore potential genes that may influence alcohol sensitivity and preference. This mapping has

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identified provisional locations of numerous genes that influence alcohol preference and sensitivity in laboratory animals, genes that ultimately may be related to comparable sites on the human genome (Crabbe et al., 1994).

In the search for inherited factors that increase the risk of alcohol-related disorders in humans, genotyping of candidate genes likewise has been used. This search has yielded multiple potential genes that may place individuals at risk for developing alcohol use disorders (e.g., see Hill, 2000). These range from changes in neurotransmitter receptors and patterns of brain electrical responses (see Hill, 2000, for review) to alterations in sensitivity to alcohol or to stressors (see Schuckit, 2000). To give one well-studied example, among the differences that distinguish pre-drinking youth with a family history of alcoholism from those without this familial background is a decrease in the strength of a particular wave in the brain electrical response to sensory stimulation [P3 amplitude] that presumably reflects inhibitory processes (e.g., see Porjesz et al., 1998, for review). Alcoholics also display this anomaly, which becomes particularly intensified in those with a family history of alcoholism (Pfefferbaum et al., 1991).

One of the genetic factors that may place individuals at risk for developing problem drinking is a relative insensitivity to alcohol. For instance, male offspring of alcoholic fathers (Schuckit, 1994) as well as male monozygotic twins having a co-twin with a history of alcoholism (Heath et al., 1999) display reduced alcohol sensitivity compared to males without a family history of problem drinking. This attenuated sensitivity to ethanol is particularly pronounced to the dysphoric effects of alcohol, such as depression and anxiety, that emerge when blood alcohol levels are falling (Newlin & Thomson, 1990; Begleiter & Porjesz, 1999). There is controversy as to whether individuals with a family history of alcoholism likewise show lessened responses to the reinforcing effects of alcohol (that emerge early during a drinking episode as blood alcohol levels are rising). Some reports support this supposition (Pollock, 1992; Schuckit, 1994), while others suggest that alcohol's euphoric effects are increased in individuals from this family background (Newlin & Thomson, 1990; Begleiter & Porjesz, 1999). A genetically-based insensitivity to at least the undesirable dysphoric effects of ethanol, when combined with a normal developmental insensitivity to these effects during adolescence, may act as a "double whammy" to trigger high consumption among at-risk adolescents.

Fetal alcohol exposure and other early exposures to alcohol

Genetic factors are not the only possible contributor to the elevated risk for alcohol-related problems seen in individuals with a family history of alcoholism. Children with this family background are more likely than others to have mothers who drank heavily during pregnancy. Fetal exposure to alcohol can result in birth defects. These range from the severe brain dysfunction, abnormal facial features, growth deficiency and behavioral/cognitive deficits that are characteristic of fetal alcohol syndrome (FAS) to less profound anomalies that have been termed "fetal alcohol effects" (FAE) (see Special Report to the U.S. Congress on Alcohol and Health, 2000, for review and discussion). Among the factors that can influence severity of effects is the pattern of alcohol use; studies in both humans and laboratory animals have shown that binge-like patterns of alcohol exposure are more likely to elicit greater alcohol-related birth defects than more moderate, continuous drinking patterns (see Maier & West, 2001, for review). Along with brain defects, similar patterns of cognitive and behavioral deficits following developmental exposure to alcohol have been reported in studies with humans and laboratory animals (Driscoll et al., 1990). Among the behavioral and cognitive alterations reported in humans following fetal alcohol exposure are lowered IQ scores, difficulty in learning new information, disruptions in cognitive functioning and psychosocial behaviors, and expression of a variety of problem behaviors (Mattson et al., 2001).

Given the brain defects and long-term cognitive and behavioral consequences of fetal alcohol exposure, it would not be surprising if it also influenced later tendency to consume alcohol and develop alcohol-related problems. Indeed, FAS offspring have been reported to exhibit an increased risk for alcohol and other drug abuse (Baer et al., 1998; Yates et al., 1998). In studies with laboratory animals, fetal exposure to alcohol somewhat consistently has been shown to increase later voluntary consumption of alcohol (e.g., Randall et al., 1983; Molina et al., 1987) although these findings are not ubiquitous (Abel & York, 1979; McGivern et al., 1984). Interestingly, more mixed findings have been obtained from animal work in terms of change in sensitivity to various alcohol effects, with studies reporting increased, decreased or no change in sensitivity after fetal alcohol exposure (see Spear, 1996, for review).

Many more children are exposed to alcohol during pregnancy than are born with alcohol-related birth defects. While the prevalence rate of FAS is on the order of 1/2-2 cases/1000 births in the US during the last several decades (May & Gossage, 2001), about 2/3rds of middle class women in the US consume some alcohol during pregnancy (Dufour et

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al., 1994). Infants and young children in the US and other countries also may be exposed to relatively modest amounts of alcohol via breast milk, through various folk treatments of ailments, or by being given alcohol at meals. While this level of alcohol exposure is unlikely to disrupt processes of brain development, these early experiences may be sufficient to influence later opinions about, and sensitivity to, ethanol. For instance, toddlers of alcoholic fathers or mothers are better at recognizing and detecting the odor of alcohol than other toddlers (Noll et al., 1990). This early environmental exposure to alcohol may influence not only later responsiveness, but also subsequent drinking behavior. At least in studies conducted in laboratory animals, experience with alcohol as a fetus or infant has been shown to influence not only receptiveness to alcohol and alcohol stimuli later in life, but also to increase preference for smelling and drinking alcohol (see Spear & Molina, 2001, for review and references).

Other potential risk factors: stress and the environment

It is not only the early environmental experiences of an individual with an alcoholic parent(s) that could influence later responsiveness and preference for alcohol. The stress of living with parental alcoholism may lead to negative affect that in itself could contribute to the initiation of drinking behavior (Chassin et al., 1996). Indeed, adolescence itself is thought to be an unusually difficult age, with teens generally reporting more stressful circumstances than preadolescents and adults (Larson & Asmussen, 1991; Larson & Richards, 1994). Adolescents may not only be exposed to more situations viewed as stressful than other aged individuals, but they may also differ in their response to those stressful circumstances as well. Studies conducted largely in laboratory animals have shown that adolescents often differ in their behavioral and hormonal response to stressors from their more mature counterparts (see Spear, 2000, for references and review). Many of the brain regions that most sensitively respond to stressors (Dunn, 1988) are the same regions that undergo considerable remodeling during adolescence (Spear, 2000).

Adolescent-associated increases in life stressors as well as their age-typical biological reactions to these stressors have been suggested to contribute to the initiation of alcohol use during this time (e.g., Pohorecky, 1991; Wagner, 1993). Although the relationship between stressors and drinking is complex, in a review of the literature conducted in humans Pohorecky (1991) concluded that stress was more convincingly associated with increased alcohol consumption during adolescence than in adulthood. In part, stressful circumstances may trigger drinking because alcohol may serve to dampen the consequences of anxiety. Indeed, individuals with a family history of alcohol show greater alcohol-induced stress-dampening (Sinha et al., 1998) and have a stress hormone system that differs in its neural regulation (Wand et al., 2001) from others.

This section examined developmental transformations in the adolescent brain and assessed their potency to foster alcohol drinking among teens. Whereas some alcohol consumption is normative by mid-to-late adolescence, most teenagers do not develop the patterns of drinking that lead to problematic use and alcoholism (Wagner & Anthony, 2002). Risk factors that may contribute to the early initiation and development of problematic alcohol use include genetic background, prenatal exposure and/or early experience with alcohol, as well as the interactions of these predisposing factors with the life experiences of the adolescent. Stresses of adolescence may trigger early alcohol use and abuse, particularly in individuals whose genetic background or early life experiences place them at risk.

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Cultural Considerations

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Introduction

Let me begin this discussion with a brief but illustrative anecdote from an anthropological expedition I made on the river Maniqui, in the territory of the scattered Tsimane settlements of Bolivia.

Our canoe was headed downstream, piloted by a Tsimane man who seemed to me to be carrying on an animated conversation with himself. Like the schizophrenics on the streets of many large cities today, this man paused at appropriate moments to listen to a voice that he alone could hear. And then he would respond. As my safety in the forest was at this point dependent upon this man's sagacity as well as his sanity, the reader can well imagine how my spirits sank as surely as if our canoe sprung a devastating leak.

It was then that my protector and guide conveyed to me the information he had gleaned from what I had presumed to be a conversation with his own demons. As it turned out, the man in the canoe had been carrying on a rich and detailed exchange of data highly pertinent to my research with a person on the riverbank, who was able to tell him that the people we were looking for had moved further south.

I could not see this other man, let alone hear him. My rush to judgment about my guide's sanity was predicated on a deficit in my own acculturation. Although possessed of what is considered in my culture to be normal hearing, I was sadly lacking in auditory acuity by Tsimane standards. Because I could not hear another voice, I assumed it did not exist. I then deduced that the man's sanity was impaired. My judgment was clouded by cultural dissonance.

It is within the caveat provided by the above story that I would like to couch the following discussion of underage drinking for the benefit of those governments, research organizations and educational institutions concerned with developing our understanding and formulating appropriate responses. Anthropology teaches us the importance of recognizing that there are many ways of perceiving what we often assume, from the narrow perspective of our own culture, to be self-evident.

The distinction of children from adults takes place in every society. Although the concept of "the underage" is variedly perceived according to distinctive socio-cultural norms concerning the rights and responsibilities of individuals of specific ages – it is possible to frame it within the generic notion of "life cycles." The birth of a child usually opens a series of rites that he/she must experience through his/her lifetime, and the sum of different life-stages thus ritually marked forms a lifecycle. This enables the identification of culturally distinctive patterns of social classification based on age, and how they are marked and transformed through time.

The concepts of "the underage" and "age of majority" must be examined within specific contexts and in relation to different activities, rights and duties. The consumption of alcohol is often prescribed or proscribed according to culturally specific life cycles. However, far from remaining unchanged, the relationship between life cycles and drinking patterns may be transformed through time. The changes observed in traditional drinking patterns are often symptomatic of broader socioeconomic transformations. Thus in order to assess the cultural specificity of such changes, it is sometimes necessary to consider the historical and socioeconomic contexts in which they take place. For example, given the growing influence of globalization processes upon contemporary societies, the distinctive ways in which alcohol consumption patterns are transformed tend to constitute just one manifestation of a larger phenomenon that affects societies in many ways.

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The task of providing an international account of general and specific ways in which such changes take place constitutes a very difficult challenge. A review of the general ethnographic literature will enable me to illustrate some drinking patterns among youngsters from different cultural contexts of the globe, which will be complemented with more detailed sketches emerging from my own field experiences in Bolivia.

Policymakers at the Crossroads

A survey of the role played by alcohol throughout the world and throughout history shows unequivocally that brewing and drinking fermented drinks is a universal part of human culture (e.g., Heath, 2000; Mandelbaum, 1965). Until we accept this as a given, we will be unable to discuss how best to minimize the social ills associated with alcohol or insure that the world's regulating bodies have the best tools to make intelligent pronouncements about both its benefits and dangers.

Epidemiological and biomedical studies of alcohol use by young people provide a foundation upon which we can build a strong and perhaps even a flexible structure of guidelines for the ways in which alcohol is used and regulated around the world. In talking about the relationship between the world's youth and beverage alcohol, though, we need to be as sensitive as possible to the cultural dissonance that can cloud our judgment, reducing our scholarly observations to little more than hot air.

The question we need to ask is not how we can regulate and control the use of alcohol to benefit the world's adolescents. Rather – in this researcher's opinion, at least -- we need to look at the ways in which different societies have successfully integrated the healthy use of alcohol into their social, religious and family life, and the lessons we can learn from this for the future.

We are at a unique point in history in that the vast majority of humankind is now participating in a global culture. Will that culture be health-promoting or health-destroying? Will our governing bodies show the cultural sensitivity needed to promulgate practical guidelines that will aid parents, schools and the media in promoting the wise and judicious use of alcohol? Or will we create yet another instance of cultural dissonance in formulating policies hopelessly out of touch with reality, policies that create occasions for youthful rebellion, crime and punishment?

Brewing and drinking alcohol is as much subject to trends and change as any other cultural practice. As Heath writes in *Drinking Patterns and Their Consequences*, "From an anthropological view, one of the most fascinating things about beverage alcohol is the diversity of cultural variations that can be found around the world, and the fact that even within a given culture, usage and the meanings and consequences of such use can be very different at different moments in history." (Heath, 1998:106).

We are at a crossroads now where we can influence the meanings and consequences of alcohol use for future generations. As we consider what further research is needed, what kinds of education programs are required and how policy should be developed and implemented, we need to be sensitive to the many different ways in which the "underage" concept is interpreted around the world.

I will be demonstrating in this paper that "underage" is both a cultural construct with widely varying ramifications in different countries, and also a legal construct, which defines the boundaries of acceptable and criminal activity for young people and those who interact with them. It is in the intersection between the cultural and legal constructs that we are to find the most fruitful ground for future thinking. If the laws of a country are out of tune with its culture, or if culture is not reflected in credible regulation, then it is more likely those problems will occur. The challenge is to find the road where culture and the law go hand in hand.

Life Cycles and Rites of Passage

Generically speaking, it is possible to observe cultural actions that symbolically mark the transition of an individual between the different "stages" of his/her own life cycle. Arnold van Gennep (1960) introduced the concept of "rites of passage" to designate such rituals, and identified three different kinds of them: rites of separation, transition, and aggregation. Rites of passage tend to highlight the individual's transitory status through the (symbolic) representation of the movement of dissociation, the state of liminality (from the Latin term *limen*, for "threshold") and the

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movement of reassertion into the corresponding new stage. They also tend to signal the prescription of the individual's appropriate behavior, in relation to his/her new status and to specific activities.

Separation, transition, and aggregation are useful concepts for the analysis of rites of passage, and we may think of them as spatial/temporal snapshots of processes through which individuals and groups are formed and transformed. The consumption of alcohol is not an uncommon practice during the enactment of these rituals in different parts of the world, and the state of inebriation is often closely associated with the participants' liminality. Van Gennep's three phases are directly related, according to the same scholar, to the incompatibility between the profane and the sacred spheres, because an individual cannot pass from one to the other without going through an intermediate stage (Van Gennep, 1960):

A man's life comes to be made up of a succession of stages with similar ends and beginnings: birth, social puberty, marriage, fatherhood, advancement to a higher class, occupational specialization, and death.... In this respect, a man's life resembles nature, from which neither the individual nor the society stands independent. The universe itself is governed by a periodicity which has repercussions on human life, with stages and transitions, movement forward, and periods of relative inactivity" (p. 3).

Birth and death are generally linked to the first and last rites of passage. Nevertheless, there are endless possibilities for the distinctive conceptualization of life cycles within different socio-cultural, geographical and historical contexts, while contrasts might also be observed in the perception of life cycles by people of different ages within the same society. In a comparative study carried out in the USA, Arnett (2001) examined how people of different ages (adolescents, emerging adults and young-to-midlife adults) conceptualize the transition to adulthood, with the following results:

"In all age groups, individualistic criteria were the most likely to be considered important markers of the transition to adulthood, specifically accepting responsibility for one's actions, deciding on one's beliefs and values, establishing an equal relationship with parents, and becoming financially independent. However, *young-to-midlife adults were less likely than adolescents to consider biological transitions to be important*, and more likely than adolescents or emerging adults to view norm compliance (such as avoiding drunk driving) as a necessary part of the transition to adulthood." (p. 133, my emphasis).

The different stages within the life cycle of an individual are usually marked according to what is locally perceived as appropriate behavior in relation to specific activities. The ingestion of different foods and drinks tends also to be prescribed and/or proscribed in reference to the subject's age. However, the consumption of alcohol not only takes a central place in the differentiation between the child and the adult, but it often is an action that marks the transition to adulthood in rites of passage observed in different cultural contexts of the world (c.f. Heath, 2000; Butler, 1990, 1993, 1998).

What Is Underage Drinking?

The term "underage drinking" predicates an assumption that there is somehow, objectively, an age at which drinking alcohol becomes both legally and culturally acceptable. However, there is no such universal watermark, any more than there is one set age around the world at which individuals are deemed ready to have sex, marry or die for their country.

Past and present examples from various traditions run the gamut from recommending beverage alcohol for babies -- no less an authority than Hippocrates advised that "infants should be bathed for long periods in warm water and given their wine diluted and not at all cold... to prevent the occurrence of convulsions and to make the children grow and get good complexions" (Heath, 2000: 145) -- to the Mendoza Code of Mexico that allowed unrestricted drinking only after 60 years of age (Medina-Mora, 1998).

Drinking among young people is relatively common around the globe, despite an assortment of rules and controls imposed on it, especially in the developed countries. According to the report presented by the International Center for Alcohol Policies, in 2002, at least 40 countries identified a minimum legal drinking age -- ranging from 15 in Belgium to 21 in Egypt, Honduras, Russia, Samoa, and most of the United States. And 49 set a minimum purchase

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age of alcohol by minors, starting at 16 – e.g. Bulgaria, Indonesia, and Italy – and going up to 21 in Belarus, Ukraine and the United States (International Center for Alcohol Policies, 2002).

On both counts, some countries arrange for a variety of exemptions under special circumstances, such as drinking at home, with meals, under adult supervision, or when accompanied by a spouse. For example, in the United Kingdom, a minimum consumption age in the home is legislated at age 5, given parental consent; in Spain, where consumption and purchase age is set at 16, those younger are allowed to buy beer and wine if accompanied by their parents; and in Slovenia the drinking age of 18 applies only to buying or drinking in public places such as bars or dance clubs. As in Spain, the type of alcohol has relevance: for example, in Norway beer and wine may be consumed at age 18, spirits at age 20 (International Center for Alcohol Policies, 2002).

Some argue that relatively high minimum legal drinking age may conjure up a certain mystique around alcohol and its consumption, leading to bouts of excessive drinking by the inexperienced. As Plant and Plant write in *Risk-Takers: Alcohol, Drugs, Sex, and Youth*, "[For adolescents] Drink is then used not merely for pleasure, not even to create an occasion for conviviality. It confers an adult status that is at once recognizable..." (Plant & Plant, 1992: 28). In the United States, risks posed by alcohol to youth and society are deemed significant enough to justify "shielding" the young from its reach several years beyond the age of majority. Such attitude would be incomprehensible in societies where alcohol consumption is seen as an important element in the traditional life and children experience their first exposure from an early age within family or community - as in France, China, Cameroon, and Italy, to name a few.

In New Zealand, it is said, "We enter the world facing backwards," our development shaped by the values and lifestyles of generations that came before us (Roche, 2001: 17). Thus, alcohol and the young, a combination condemned in some societies, is permitted in others. Prevalent drinking patterns, as well as attitudes and norms surrounding the experience with alcohol in a given community create a continuum of relatively "wet" and "dry" cultures (e.g., Room, 1992). In the former, alcohol is seen as an intrinsic part of everyday life. The "wet" cultures - from the Han in China to Russia and Honduras, to Italy, France, and the former Yugoslavia -- are generally more permissive of a relatively high per capita consumption not only for adults, but also the young. The Han, a major ethnic group in China, hold six rites of initiation during various stages of a boy's maturation, with drinking playing an important part in all of them (Heath, 2000). In Honduras, exposure to alcohol begins within a family setting as early as eight to ten years of age, and becomes somewhat of a habit in young men of fifteen to nineteen years old (Vittetoe-Bastillo, 1995). And it is not uncommon for a French child to receive a glass of "reddened water" (diluted wine) with family meals and celebrations, the concentration of wine increasing as the child gets older.

This is quite a contrast to Iceland, where drinking at home, especially in the presence of children, is inappropriate, one drinks in strictly defined situations (such as on round-number birthdays), and drunkenness among adolescents symbolizes an act of independence and rebellion against their parents (Asmundsson, 1995). The "dry" cultures - from Iceland to Mexico, from India and Israel to Saudi Arabia - view alcohol with ambivalence: as a powerful substance, dangerous and unfit in everyday use. These cultures embrace many abstainers and favor strong regulations against drinking, resulting in relatively lower per-capita consumption but also in bouts of episodic and heavy drinking among some segments of population.

Mexico is a curious example of a dry culture. As observed by Medina-Mora, it has a high rate of abstainers, "the dominant pattern of heavy drinking is rarely very heavy, and binge drinking is common, amid high rates of death from alcohol poisoning, violence, and social disruption associated with heavy drinking" (Medina-Mora, 1998: 279). Yet Mexico does not share a temperance tradition with other "dry" cultures, as the special "flavor" of Catholicism adapted here integrates alcohol, and even its heavy use, in rituals and festivals. Thus, while alcohol is woven into the everyday life of the Mexican society, it is perceived harmful, especially for some segments of the population. In fact, in Mexico today "norms are still more directed towards defining who may drink than towards moderation" prescribing abstinence for adolescents under 16 and people over 65 (Medina-Mora, 1998: 269).

The type of alcohol beverage in question is also relevant. According to the Polish tradition, for example, it is socially unacceptable to drink beer before turning fifteen, wine before eighteen, and vodka before twenty (Moskalewicz and Zielinski, 1995).

In cultures where homebrew is a basic component of diet, the young experience alcohol at an early age, as women are encouraged to drink traditional beer or wine during pregnancy and breastfeeding, and these traditional drinks are

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widely viewed as a food staple by men and women, young and old alike. Thus, in sub-Saharan Africa, the traditional drinks fermented from cereals or tapped from palm trees were often given to infants and young children as nourishment, supplementing or even replacing breast milk (Muokolo, 1990). In some Balkan countries, parents fed their babies bread soaked in a "tonic" of wine and water for better sleep. And in Western Europe, beer (in Germany, Austria, and Switzerland) and wine (in France, Spain, Portugal and Italy) figure in a variety of proverbs that hail these drinks' ability to strengthen bones, purify the blood, and enhance growth before and after the child is born (Heath, 2000). Contrast this to active advocacy of abstinence during pregnancy in the United States, Canada and Denmark, where alcohol is generally perceived as harmful to the fetus and young children (International Center for Alcohol Policies, 1999).

In some countries distilled spirits are seen as distinct from other alcohol beverages. It is a widespread pattern that children and even adolescents are strongly discouraged to drink, and are even precluded from gaining access to, spirits. This pattern is not followed by all, however: the Dusun of Borneo indulge in rice beer and palm gin "at almost every social occasion and consider both drinks to be powerful medicines for virtually every childhood malady... Drunkenness is not any more uncommon among Dusun children, than it is among their elders of both sexes." (Heath, 2000: 78).

These culture-specific attitudes and patterns of drinking, although not immune to change across time and space, are passed on from generation to generation. Elsewhere (Araoz, 1995), I have shown how an intricate kinship network is constructed and reconstructed across the scattered Tsimane settlements through the movement of people, fluids and information. In what follows, I will use the notion of embodiment and the analogy between biological and social bodies to analyze the transformation of drinking practices amongst the Tsimane.

Apart from adapting to the natural environment, it is also necessary to learn the social norms, when traveling in an alien context: The most common occurrence upon arrival to a Tsimane settlement is the consumption of *chicha* (cassava beer). While asking about their relatives, the travelers also inquire about the availability of *chicha* in the settlements. I cannot provide here a detailed description of the production, distribution and consumption of *chicha*, but some features must be underlined. Both men and women participate in the production of cassava, although gardening is a task most often carried out by women, who are also the ones in charge of producing *chicha*. All mature women participate in the elaboration of *chicha*, which is shared by all.

There is a stark contrast with the consumption of food which, as Ellis (1996) shows, is much more restricted to the immediate kin. The production of *chicha* involves the fusion of the women's bodily fluids, since an important part of the process consists of chewing and spitting cassava into a container for it to be later sieved and fermented. Although menstruating women must not participate in the production for general distribution, they may produce their own *chicha*. Similarly, they may drink from the communal beer, but must use a separate gourd to do so. It would be relevant to consider briefly the notion of "pollution" -- introduced by Mary Douglas (1984) to explain the diverse conceptualization of dirt and purity within different classificatory systems -- in relation to such proscriptions. Bodily fluids (saliva, in this case) are not necessarily polluting in themselves; it is their presence "out of context" or "out of order" which renders them dangerous, polluting or, simply dirty. The ambiguity of bodily fluids observed in the Tsimane case is particularly relevant for the discussion of drinking practices.

The production, distribution and consumption of *chicha* create sociality through the flow of beer and the movement of people and information between settlements. It is believed that the women's saliva is ambiguously powerful. It creates sociality, as it is a basic ingredient of (the socially produced, distributed and consumed) fermented drink. However, saliva may also carry the anger of a woman, which renders *chicha* a suitable medium for sorcery. Ellis (1996) provides a detailed discussion of this, but also stresses the most often positive and friendly atmosphere of sharing the drink.

The Tsimane consumption of pure (178-proof raw fuel) alcohol entails however completely different relations. This highly concentrated ethanol -- about 89% by volume, according to Heath (2000) -- was introduced to the Tsimane by external agents. The outsiders use the substance as a means to indebted the Tsimane, who after a few "complimentary drinks" get hooked and commit their production of the highly valuable *jatata* palm tree roof panels⁴ exclusively for the river traders, who bring more alcohol when they return to collect their profits.

⁴ The Tsimane are known as the best weavers of the *jatata* panels, which provide protection and freshness to most of the houses in the urban and semi-urban towns.

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As Heath (2000) reminds us, alcohol has often been used as,

"...a tool of colonization, a scarce economic good with which they interest and engage native peoples, and later as a substitute for cash which can keep those peoples in an underclass subservient to those who control the supply" (p. 92).

Apart from the obvious violence of such an unfair trade, the consumption of highly concentrated alcohol also disrupts the otherwise peaceful atmosphere of Tsimane sociality. While the power of *chicha* might be considered ambiguous, the negative aspects of highly concentrated alcohol consumption are most often stressed by the Tsimane themselves.

The health of both (individual) biological and (collective) social bodies depends significantly on the harmonious flow of people, information and *chicha* throughout the scattered Tsimane settlements. Tsimane sociality relies then heavily on the flow of good mood through the saliva shared in the consumption of *chicha*.

The analogy of the biological and social body is clearly illustrated in the flow of people, *chicha*, bodily fluids and information through the rivers. An ill (biological and social) body is often interpreted as the result of the disruption of harmonious relations between individuals and their (social, natural and supernatural) environment. The Tsimane are often concerned about their (social and biological) well being, and eventual diseases are often explained in relation to inappropriate behavior, which is most clearly manifested through anger. As mentioned earlier, *chicha* is perceived as ambiguous, because it is used to create sociality, while it can also be the medium for sorcery.

However, the introduction of highly concentrated alcohol through the same hydrological system that is used by the Tsimane to socialize in harmony has resulted in important changes in their drinking practices. Alcohol is often linked to violent behavior and unequal relations. While it is suggested that some Tsimane might use *chicha* for sorcery, no individuals would actually admit to doing this themselves. In contrast, river traders use the Tsimane fear to put pressure upon the indebted weavers, with threats of sorcery and anger. Thus the local (hydrological and beliefs) system is used to introduce illness into (collective and individual, social and biological Tsimane bodies).

Conclusions

The concept of "underage drinking" is intrinsically linked to a specific proscription, namely the consumption of alcohol by individuals who are below some culturally or legally defined threshold. However, we must be particularly careful to distinguish instances of transgression from other cases in which a more general and socially-accepted consumption of alcohol by youngsters is observed. In the latter case, it is necessary to pay particular attention to the processes through which a previously unacceptable behavior becomes not only acceptable, but probably a norm (e.g. by peer pressure). This might entail the need to redefine notions such as that of "underage" in the light of broader cultural, socioeconomic and political transformations, and to explore the impact of these upon local realities.

As Heath (2000) writes,

"The concern that granting young people permission to drink would result in worse outcomes -the opposite of what we would expect on the basis of cross-cultural evidence- perpetuates the paradox of so-called protection which often turns out to be far more harmful." (p. 80).

The same author suggests that the use of alcohol in sacred contexts constitutes a form of immunization, and notes that amongst Jewish communities (where ritual drinking takes place from an early age on), drinking problems are only rarely developed. He also underlines that the customary drinking age tends to be lower than the legal drinking age in the United States, where the concern of young drinkers has become especially acute in reference to college students (Heath, 2000).

Miller and Vaughn (1990) observe that many college students have already acquired their drinking habits and attitudes during their teenage years, and that the norms that young people learn about drinking are very important, since alcohol use and abuse is a socio-cultural phenomenon. They found that adolescents who had no norms to use as guidelines were more likely to abuse alcohol, and suggest that providing young people with specific (prescriptive or

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proscriptive) drinking guidelines would ensure the transmission of these to future generations, as they will be carried by the youngsters into adulthood.

Wylie et al. (1990) believe that prevention programs must address the question of whether young people see the consumption of alcohol as a rite of passage into adulthood. If they do, then alternative ways of achieving adult status must be provided (Wylie et al., 1990). Butler (1990, 1993, 1998) underlines that alcohol use has become a major ritual in the passage from childhood to adulthood, and that college students face in the United States the challenge of finding or devising appropriate rigorous rituals that mark their recognition as members of new groups, without resorting to dangerously addictive ritual activities.

Although especially acute in the United States, the "problem" of underage drinking is causing concern in many other countries as well. Often linked to inexperience or to the introduction of new beverage categories, the drinking patterns of young people clearly require special attention. The question is whether the definition of a minimum age for consumption or for purchase is either necessary or sufficient. The international consensus would seem to be that such a definition is necessary (although it may not be the same for every country) but that it is certainly not sufficient. A more complex response is required.

Returning to our case study, the transformations of Tsimane drinking practices refer mainly to the substance used, since the consumption of *chicha* is clearly distinguished from that of highly concentrated alcohol, as we have seen in the previous section. Although there are no age restrictions for drinking *chicha* amongst the Tsimane, some strange adolescent behavior is often attributed to the early consumption of this highly concentrated alcohol. Although there are no concerns about underage drinking regarding the consumption of *chicha* beer, adults do express their disapproval of teenagers drinking highly concentrated alcohol. Only since this form of alcohol was introduced into their settlements has underage drinking been perceived as a problem amongst the Tsimane. Thus the (previously non-existent) problem consists in this case mainly of what and how people drink, rather than who (and at what ages).

Like the pilot of my canoe, whom I described at the beginning of this paper, we need to be sensitive to the many unheard voices in society if we are to develop research, education and policy responses that adequately address the issue of underage drinking. We need to listen, not just to those whose opinions happen to coincide with our own, but also to those who take different points of view, based on different perspectives. Some of these voices may be arguing for stricter regulation, some may be arguing for more individual freedom; some may see the state as the primary locus of control, others may see the family as the main arena for change; some may see a role for the beverage alcohol industry, others may argue that their conflict of interest is simply overwhelming. My own perspective is that there is no reason to exclude any interested party from the debate, provided that they are transparent in their intentions and that they behave responsibly.

After all, given that young people are the world's most precious resource, I know this difficult-to-define subject of underage drinking to be a valuable and important topic. If we let go of as many of our assumptions as possible, we may actually be able to glean some insights into the wide variety of relationships between young people and alcohol and perhaps even gain some wisdom about the best ways for regulating bodies the world over to create policies that promote both the health and happiness of our youth.

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Implications for Research

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In most of the developed countries, underage drinking is prohibited by law. Minimal legal drinking age (MLDA) ranges from 16 years old to 21 years old (World Health Organization, 1999). Despite these laws, many young people in the prohibited age range do drink alcohol, and substantial percentages of them have already started excessive drinking. In the review by Dr. Choquet appearing in this monograph, drinking behavior among adolescents in European countries and the United States is concisely described. Summarizing the results of the European School Survey Project on Alcohol and Drugs (ESPAD) conducted in 1999, the review stated that more than 80% of students ages 15 and 16 years old have consumed alcohol at least once, and in the large majority of European countries, more than half of 16 year olds have been drunk at least once in their lifetime (Hibell et al., 2000). The Monitoring the Future Study in the United States reported that approximately 30% of 12th graders engage in binge drinking, i.e., having at least five or more drinks on one occasion within the last 2 weeks (Johnston et al., 2002).

In his article of this monograph, Dr. Araoz discusses cultural aspects of underage drinking, and provides information on drinking norms and practices in different cultures. Japan, which appears in neither of these reviews, has experienced steady increase in per capita alcohol consumption after the World War II, although it may have leveled off for the last several years (National Tax Agency, 1955-2003). Researchers have pointed out that the sharp increase in alcohol consumption in so-called “new drinking populations”, such as adolescents and women, greatly contributed to the increased level of per capita consumption (Saito, 1997; Higuchi et al., 2003). An age-20 MLDA policy that has been maintained for more than 80 years appears to be of limited effectiveness in this highly industrialized but newly westernized society. A nation-wide survey conducted in 2000, covering more than 100,000 junior-high and high school students, revealed that 46% of junior-high school students and 67% of high school students consumed alcohol at least once in the course of the past year (Suzuki et al., in press).

What is the actual basis of the law prohibiting minors from drinking? Although adolescents drink alcohol in various ways, their overall alcohol consumption tends to be lower than that of adult counterparts in many countries. Thus, if the same amount of alcohol affected body functions and caused damage both to themselves and others equally in both adolescents and adults, the policy banning underage drinking would lose its ground.

Research has played a major role in providing the aforementioned policy with a scientific basis and justification. For example, biomedical research has accumulated evidence for the adolescent-specific risk of alcohol-related physical and psychological problems and underlying mechanisms for the risk. The article prepared by Dr. Spear in this monograph extensively discusses recent advances in this research area. Epidemiological research has identified potential contributing factors for the increase in alcohol consumption among adolescents, and has suggested immediate and long-term risks. Utilizing information obtained from these research areas, researchers have developed programs and have examined their efficacies on prevention and treatment of problems associated with adolescent alcohol consumption.

In this commentary, the author will briefly outline research findings on underage drinking, mainly focusing on those that are not mentioned in the articles by Drs. Choquet, Spear, and Araoz. This is supplemented with future research directions.

Risk factors for underage alcohol use and misuse

Risk factor research is important for prevention of underage alcohol use and misuse. In her article in this monograph, Dr. Spear discussed the implications of biomedical risk factors including genetic factors and the effect of prenatal exposure to alcohol, with the emphasis on underage drinking problems. Of these biomedical factors, genetic factors are thought to play a major role in determining the risks for alcohol-related problems in adolescents and adults. Indeed, studies reported that 40-60% of the risk for alcohol dependence in adults could be explained by genetic

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factors (Pickens et al., 1991; Enoch & Goldman, 1999). Although enormous efforts have been made to identify genes for alcohol-related problems, only two genes constituting the first two steps of alcohol metabolic cascades have been identified (Yoshida et al., 1990). They are alcohol dehydrogenase (ADH) and aldehyde dehydrogenase-2 (ALDH2).

The underlying mechanism of ALDH2 influence on drinking behavior and the risk of alcohol-related problems is rather straightforward. In contrast, how ADH is involved in the risk of alcohol abuse and dependence has not been fully elucidated. An inactive form of ALDH2 produced by one nucleotide replacement of the gene causes adverse reactions due to high acetaldehyde concentration in the blood after drinking (Yoshida et al., 1990). This reaction is usually severe enough to deter further drinking and resultant problems (Harada et al., 1981; Higuchi et al., 1994). Due to the accumulation of acetaldehyde in the blood, the elimination of alcohol itself from the body is slower in individuals with inactive ALDH2 than in those with active ALDH2 (Yamamoto et al., 1993). Therefore, the risk of problems related to acute alcohol intoxication, which is often observed in adolescents, is speculated to be high in individuals with inactive ALDH2. Although ALDH2 exerts significant influence on alcohol use and misuse as mentioned above, this evidence is not widely known in the United States or European countries. This is because inactive ALDH2 is only found in people of Asian ancestry. Nearly half of people possess this type of ALDH2 in Japan, China and Korea.

In Japan, risks associated with different ALDH2 types are taught in prevention programs from the junior high school level through the college level based on use of the ethanol patch test. This test is a skin model of the adverse reactions, which can discriminate different ALDH2 types with more than 90% accuracy (Higuchi et al., 1987). In the class, students are administered this test followed by provision of information on risks associated with ALDH2 and more general adolescent-specific problems related to drinking. Although the efficacy of this program has not been evaluated, observing their own reactions in the skin to alcohol seems to heighten students' interest in the program.

Consequences of underage drinking and related findings

Alcohol metabolism

Developmental changes of alcohol metabolism may influence the outcome of alcohol exposure. For example, higher blood alcohol concentration (BAC) associated with low ethanol elimination rate (AER) should increase an organ's vulnerability to damage by alcohol. Animal studies have shown that young rats were much less efficient than older rats at eliminating alcohol from their bodies (Ott et al., 1985; Kelly et al., 1987). Based on these results, it is assumed that AER in human adolescents is lower than that in adult counterparts. Because of ethical limitations, however, this assumption has not been confirmed in laboratories. Instead, AER was calculated in children who were hospitalized for the treatment of acute alcohol intoxication. Surprisingly, children (1.5-13 years of age) were reported to eliminate ethanol nearly twice as fast as adults, the rate of decline in the BAC being 5-9 mmol/hour (Leung, 1986; Lamminpää, 1995). Inconsistency in AER results between animal and human studies most likely came from the difference in experimental conditions, warranting further research.

Immediate consequences

The brain is the most important organ when we address adolescence-specific organ damage of alcohol. In this light, the effects of alcohol on development of the brain and alcohol-induced brain damage due to underage drinking are extensively reviewed in the article by Dr. Spear in this monograph. Other organs that are not covered by her review, but are important in assessing the consequence of adolescent alcohol exposure are male and female reproductive systems and bone. Animal studies have suggested significant adolescence-specific effects of alcohol on these parts of the body.

Alcohol consumption during early adolescence may suppress the secretion of reproductive hormones, thereby delaying puberty and adversely affecting the maturation of the reproductive system (Dees et al., 2001). It has been shown that the normal pubertal increase in serum testosterone levels, and the weights of testes and secondary sex organs were substantially reduced in alcohol-exposed prepubescent male rats compared with controls. In contrast, the effects of alcohol on reproductive endocrinology in fully mature rats were transitory and of a considerably lesser magnitude (Cicero et al., 1990). This adolescence-specific effect of alcohol on the reproductive system was confirmed in female rats and monkeys as well (Dees & Skelley, 1990; Dees et al., 2000). Likewise, the skeletal consequences of alcohol intake during adolescence are especially harmful (Klein et al., 1997). For example, chronic

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alcohol exposure during the age of bone development (adolescence) reduced both bone density and peak bone mass in female rats (Sampson et al., 1996). Of course, we should be careful when we interpret these findings because what one observes to be true in animal studies does not always translate to humans.

Among social aspects, adolescents are prone to aggressive and risky behavior and to involvement in accidents while under the influence of alcohol. The relative risk of a fatal crash for drivers with positive BACs increases with increasing BAC, and the risk increases more steeply for young drivers than older drivers (National Institute on Alcohol Abuse and Alcoholism, 2001). Analyzing the 1996 National Roadside Survey of Drivers in the United States, Zador et al. estimated that a BAC increase of only 0.02% more than doubled the relative risk of fatal single-vehicle crash injury among 16-20 year old male drivers (2000).

There are some studies that show an association between excessive alcohol consumption and risky sexual behavior and sexual assault among young people. In reviewing the extant literature, a study reported that drinking is closely related to the decision to have sex and to indiscriminate forms of risky sex, e.g., having multiple or casual sex partners (Cooper, 2002). It may also place adolescents at a greater risk of initiating early onset of sexual intercourse and engaging in unprotected behavior, especially in the first sexual intercourse (Fergusson & Lynskey, 1996; Cooper, 2002). On the other hand, sexual assault is extremely common in some populations among young people. For example, at least half of these assaults among college students in the U.S. were reported to involve alcohol consumption by the perpetrator, the victim, or both (Pedersen & Skrondal, 1996; Abbey, 2002).

Long-term consequences

When we discuss underage drinking, clarification of long-term consequences, i.e., the effects of underage drinking on the health status in later life, is equally important as the immediate consequences mentioned above. Dr. Spear summarizes the association between early exposure to alcohol and later consequences, stating “with some notable exceptions, numerous studies have shown that the earlier the onset of alcohol use among human adolescents or even pre-adolescents, the greater the probability of later problematic use and dependence on alcohol.” This relationship does not seem to be limited to drinking behavior. Using a national longitudinal database, researchers reported that early initiation of alcohol use is associated with an increased risk of experiencing alcohol-related injuries (Hingson et al., 2000). Then an important question arising is whether this association between drinking onset and alcohol misuse is causal. If it is causal, delaying the initiation of alcohol use will be effective in prevention of alcohol-related problems in late adolescents and adults. However, the causality of this association is highly controversial (refer to Dr. Spear’s article in this monograph).

In addition to the onset of drinking, examining the relationship between drinking patterns during adolescence and later alcohol-related problems is another important research topic. Like onset of drinking, the findings from these studies can be directly used for prevention programs. Although research has been undertaken (e.g., Hawkins et al., 1997), accumulation of evidence is not sufficient. Thus, additional research is necessary to clarify further the relationship between both the onset and patterns of drinking during adolescence and later alcohol use and misuse.

Future research directions

As described in articles by the three authors, there have been enormous advances in research on underage drinking. However, from a global point of view, one might observe little progress in reducing the magnitude of problems related to underage drinking. To tackle this serious disconnect, research efforts should be further intensified. With regard to future research directions, each author has provided concrete suggestions. By reviewing the research activities, the present author found that the following three areas are especially important for breaching the gaps in knowledge and for reducing the level of problems.

Effect of moderate drinking

Although some adolescents are engaged in problematic drinking, the majority in most countries is in the stage of moderate drinking. Extant human and animal research has focused on organ damage due to excessive drinking, with some rare exceptions (Bates & Tracy, 1990). Even moderate drinking at this developing stage might affect bodily functions and cause subtle damage that could harm the health status in later life. Human research may consist of both cross sectional and prospective longitudinal studies with behavioral, neuropsychological, and neuroimaging

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techniques incorporated.

Prevention research

Research on primary and secondary prevention is important because it is directed to reduce underage drinking problems. With regard to primary prevention, numerous community and educational interventions have been undertaken. One example is the Project Northland which combines individual-based strategies to encourage adolescents not to use alcohol with community-based strategies to both reduce alcohol availability and to modify community attitudes concerning youth drinking (Williams & Perry, 1998). The first three years of intervention resulted in significant reduction in alcohol use in 6th through 8th graders (Perry et al., 1996). However, a recent review on the efficacy of primary prevention programs revealed that almost none of these interventions including Project Northland showed longer-term effects on alcohol use (Foxcroft et al., 2003). Thus, improvements of intervention programs are necessary, and such programs should be culturally bounded and be effective in both developed and developing countries.

Need for global research network

At present, most of the research on underage drinking is carried out in limited areas of the world, e.g., in North American and European countries. Therefore, the body of knowledge on this topic lacks information from outside these countries. Since genetic and environmental backgrounds and patterns of alcohol use and misuse are greatly diversified among different countries, information from other areas will significantly contribute to the advancement of research on underage drinking. Formation of a global network based on multinational or multi-institutional collaboration should facilitate research activities.

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Implications for Educators

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This paper aims to reflect the main issues that arise for educators in the light of the information contained in the three papers:

- Epidemiological Considerations of Underage Drinking by Dr. Marie Choquet
- Biomedical Aspects of Drinking by Youth by Dr. Linda Spear
- Cultural Considerations by Dr. Gonzalo Araoz

The purpose is to identify series of items and issues that should be explored within the educational context, where the matters raised by the papers have implications for providing appropriate alcohol education for young people and the general public, and which can inform and “educate” those who work at the professional or policy development level.

The paper does not:

This paper does not attempt to provide the scientific detail that underpins the educational implications. This is contained within the papers.

It is important and it requires further work to assess and suggest how the issues identified are best dealt with in the educational setting for the provision of alcohol education in order to make it relevant and accessible to different target groups. It does not aim to address the age and stage at which any specific item should be included into any alcohol education provision or educator’s agenda. Nor does it aim to suggest how the particular issues identified might best be offered or integrated into the education process or curriculum. It does not offer any developmental ordering of the issues as they might be addressed within any educational provision. It does not address the methodology that would be appropriate to allow the issues to be considered meaningfully so as to impact on the young person’s knowledge, attitudes and ultimate behaviour or to develop the personal and social skills, confidence or competence that would enable him/her to function positively, effectively and with the objective of leading a “healthy life” as a result of such “education”. Nor does it address how the items listed could be best used in order to educate other target groups be it the general public, health professionals or policy makers. This paper focuses on the “what” for educators as implied by the papers addressed, rather than the “who” and the “how” of what needs to happen in order to allow the issues to be appropriately translated and implemented into the education context.

Some broad considerations in relation to these issues are reflected in the closing comments.

Implications for Educators:

a. Epidemiological Considerations of Underage Drinking by Marie Choquet

The information provided in this article indicates a further range of issues that need to be addressed from an educational perspective if the matter of alcohol and underage drinking is to be explored appropriately.

(i) Addressing, Assessing and Understanding Broad Concepts:

- The concept of “adolescence”.
- The concept of risk-taking and “high” and “low” risk.

(ii) Consideration, understanding and application of the concepts and other specific issues in relation to alcohol:

- Availability of alcohol and the laws/customs governing its use and legitimacy of use in different countries and cultures.
- Understanding the concepts and definitions of alcohol “users,” “abusers,” and “dependents”. This would also explore the notion of “experimenters” and the meaning of “regular use” and such terminology as “chronic drinking,” “heavy drinking,” “alcohol misuse,” and “hazardous drinking”.
- Being able to interpret data on alcohol consumption, e.g. between different countries where the “type” of drinking may affect the understanding of the data.
- Awareness of the concept of “drinking behaviour patterns” and the associated phenomena and effects in relation to: types of alcohol beverages consumed, settings for alcohol use, amounts drunk, binge drinking, drunkenness, etc.
- Awareness of different drinking patterns in different parts of the world among young people and an awareness of the reasons for the differences.
- The “models of consumption” concept and the associated risks related to each model.
- Changes in drinking patterns, e.g. types of drink, frequency and amounts, and their implications.
- Addressing the reasons and motivations for people choosing to drink and their associations in relation to potential benefit and harm that the motivation and its use might involve or produce.
- The concepts of “low risk” and “high risk” drinking and the settings associated with different types of alcohol use.
- The relationship between the type of beverage and consumption.
- Age and gender issues and behaviour outcomes in relation to alcohol use.
- Alcohol use and its relation to social and economic status
- The family, parents and peers and their impact and influence (negative and positive) in relation to alcohol use behaviour in different cultures.
- The concept of alcohol as a “gateway drug” and its use in relation to other drugs.
- The relationship between alcohol use and those with emotional and social problems.

b. Biomedical Aspects of Drinking by Youth by Linda Spears

The Biomedical Aspects of Drinking imply a further range of issues that should be part of an educational treatment of the use of alcohol or within alcohol education. The three key questions explored by the paper provide key general questions that require exploration within any education setting:

- Why do adolescents begin to use alcohol?
- Why do some engage in high levels of use?
- What are the consequences of use, particularly the high level use?

The paper addresses these three questions and indicates that some of the answers can be best found by addressing the issues surrounding the biomedical aspects of adolescent drinking.

(i) Addressing, Assessing and Understanding Broad Concepts:

- The concepts of a “causal relationship” and “predisposing risk factors”.
- The concept of “risk factors”.

(ii) Consideration, understanding and application of the concepts and other specific issues in relation to alcohol:

- The range of developments and changes of the brain during adolescence and its potential impact on emotions and behaviour and other physiological functions.
- The possible impact and consequences of alcohol on developments and changes in the brain in relation to such issues as emotional response and risk-taking behaviour.
- The possible physical and behavioural effects on the brain of adolescent alcohol exposure.
- Differences between the brain of the adult and the young person/adolescent and how they differ in the way they adapt to alcohol.
- Understanding the concept of alcohol “tolerance”.
- The impact of genetics in relation to alcohol and its effects.
- The role of family history in relation to alcohol use, misuse, and/or problem drinking.
- An understanding of views on “foetal alcohol exposure/syndrome”.
- The relationship between environmental stress and a predisposition of adolescents to develop alcohol-related problems.

c. Cultural Considerations by Gonzalo Araoz

In order to have an appreciation of the cultural issues surrounding alcohol use there is a number of elements that would be necessary in the alcohol education provision. These include:

(i) Addressing, Assessing and Understanding Broad Concepts:

- The concept of culture and cultural differences in relation to different behaviours within the international community.
- The concepts of “childhood,” “underage,” and the “age of majority” as it applies to different laws, rights, duties and behaviours in different cultures.
- The concept of “socioeconomic transformation” and globalization and how these processes influence changes in societies and alter patterns of behaviour.
- The concept of “rites of passage”.
- The concept and meanings of being a child and being an adult within different cultures.
- The concept of “social norms” and their value, relevance, and impact on behaviour.
- The concept of policy and the impact it has, or may not have, on societies.

(ii) Awareness, Assessing and Understanding:

- The relationship between culture, law, and the concept of “underage”.
- Addressing “rites of passage” and its expression in different cultures and its application and relevance to young people.
- The impact of restricting availability and of restrictive or repressive attitudes and laws on the use of certain things and behaviours by young people.

(iii) Consideration, understanding and application of the above and other specific issues in relation to alcohol:

- A study of different alcohol attitudes, behaviours and drinking patterns among different cultures and an appreciation of the reasons for the differences and the changes that may be occurring.
- Alcohol laws, availability, roles, and use through history and within different cultures.
- The concept of culture and cultural differences to alcohol use within the international community.

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- “Social norms” and their value, relevance and impact on alcohol-related behaviour.
- An appreciation of the range of attitudes and behaviours in relation to alcohol and its use among different cultures and groups.
- Being a child and being an adult within different cultures and the relationship of this to attitudes and behaviour concerning alcohol.
- “Rites of passage,” their use, and the associated alcohol consumption behaviour.
- The affect of restrictions and availability of alcohol on young people’s attitudes and behaviour. This would include issues around the “mystique” of alcohol where availability and use is restricted in some cultures and issue such as “binge drinking” once it becomes available in other cultures.
- Awareness of “Home brews” and indigenous forms of alcohol within different cultures and their relevance to current attitudes and use of alcohol.
- Different attitudes and behaviours in relation to alcohol use: for example, as a beverage or a food or for use in celebration or as part of religious rites.
- Effects of alcohol on the body.
- The impact of restricting availability and of restrictive/repressive attitudes and laws on the use and behaviours by young people in relation to alcohol.
- “Socioeconomic transformation” and globalization and how these processes affect changes in societies and change patterns and behaviour in relation to the use of alcohol.
- A discussion of the social problems that can be caused by alcohol and consideration of the benefits and dangers that occur with the use of alcohol within different cultures.
- Appreciating the difference, considering the lessons, and assessing the appropriate approach to alcohol use by young people between the standpoints of *Regulating and controlling the use of alcohol to benefit the world’s adolescents* and that of *Considering the ways in which different societies have successfully integrated the healthy use of alcohol into their social, religious and family life*.
- Alcohol and its impact, contribution, or effect towards health and health promotion.
- Developing an alcohol policy that would be relevant, pragmatic, and beneficial to global and local communities and the difference that might or should pertain among different cultures. This also raises the debate as to whether policies should encourage “wise and judicious use of alcohol” or develop policies that are restrictive and promote negative messages about alcohol and its use, where both would have the stated objective of safeguarding society.
- A discussion of the need for and nature of alcohol education for young people.

Conclusions:

Each paper was reviewed for its implications for alcohol educators particularly with respect to addressing the issue of underage drinking. The information within the papers provides a significant list of issues that may need to be addressed as part of any comprehensive education provision for young people or for parents and indeed professionals and the general public. This would allow the educators and educated to become better informed of the key issues relating to culture, bio-medics, and epidemiology of the use and effect of alcohol. Such debates of the matters identified enhance the development of appropriate, relevant, and pragmatic attitudes and policies about alcohol and its use and place the issue of underage drinking within the global context. Many of the items are duplicated or reinforced in more than one of the papers. Some are specific to the particular issue of culture, bio-medics, or epidemiology.

The issues raised identify not only alcohol-specific issues and information, but also the more general concepts that need to be explored and understood before they can be applied to particular alcohol-related areas.

The educator would also need to address other issues that should be added to the list relating to alcohol and its use and prevention of its misuse: for example, health, social and economic factors. Combined, these would

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produce a significant education agenda that should be offered to provide a well-researched and thoughtful response in terms of the ensuing attitudes, behaviour, and policy and for reviewing the issue of underage drinking.

The three areas highlighted in this paper offer some significant new areas for consideration within the education agenda. The issue of culture is often given lip service but rarely results in the focus and content required to address the issue of alcohol use generally, and by young people specifically, within the global context. As the world operates increasingly within a global framework, the issue of alcohol use becomes one that increasingly has to reflect the cultural considerations that need to be addressed.

Epidemiology often remains a special domain of the researcher and the academic. However, it has lessons to offer to all those who are concerned with the issue of alcohol and its use and can better inform both the policy maker, the professional and educator to help them assess key factors relevant to alcohol and young people. The matters identified within the paper provide a list of issues that are both relevant and informative.

Perhaps, most interesting and significant are the biomedical aspects and the education agenda they imply. Whilst the area still remains one where there is a lot of uncertainty and need for more research and evidence, it does raise key questions about alcohol and its use and effects on young people. This is an agenda that is rarely acknowledged by those who act as alcohol educators but one that could significantly inform behaviour and policy development in relation to the way we might better address the appropriate use and help avoid the misuse of alcohol. Even if there is inconclusive and conflicting opinion and evidence in relation to this area, the debate needs to happen and further work needs to be undertaken and translated for the benefit of those who work as educators or policy makers.

A final word on the issue of education. The items identified above are relevant to those working as educators. However, as they have been identified and listed, it would be too easy to see them as issues that must be translated as nothing more than additional information on the agenda of knowledge to be imparted on young people and others. If the issues suggested above are to be transferred into a practical agenda for educators, there has to be further work to develop them into a usable format and into an appropriate structure. This will allow them to be designed for the appropriate target group, to be offered at the relevant time, and with a developmental agenda of alcohol education within the context of health education, particularly where the target group is young people. Furthermore, the items need to be addressed with an appropriate methodology that allows the issues to be explored, debated and applied in a meaningful way that allows the range of discussion and debate that the matters raised require. It is only then that they can become areas of learning that impact attitudes and behaviour, and which can then change or direct policy development.

If the papers above and the issues they raise for educators are to be added to the education agenda in respect of the discussion on underage drinking, and there is no doubt that they should be, it will be essential for further work to be undertaken to ensure that they are considered in respect of clear objectives, with an appropriate methodology, and alongside the other pertinent issues that will inform that particular debate and development.

Public Policy Considerations

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Introduction

For those of us who live in the cities of the United Kingdom, and for those long-suffering residents of European cities visited by British football teams and their supporters, or by planeloads of young British holidaymakers, the image of young and out of control drinking is only too familiar. Urban youth culture in the United Kingdom and, it appears, in other parts of Northern Europe centers around social encounters in bars and clubs. Binge drinking, however defined, is a significant problem.

Need it be so? Other societies, notably in Southern Europe, seem to escape these problems, and to foster a much healthier and calmer approach to alcohol among young people. In the United States, a much stricter regime governing access to alcohol by young people seems to be holding up. Yet the situation could move either way. Are there lessons to be learned from what I shall call the Southern or Mediterranean culture? Or is there in prospect some kind of ghastly convergence, with the United Kingdom's and Northern European youths blazing a trail?

The three papers by Drs. Choquet, Spear, and Araoz provide invaluable insights into the background of underage drinking, from different perspectives. Epidemiological data provides some unexpected perspectives and some comfort: for example, that many young people try alcohol without then becoming regular drinkers and that much early experimenting with alcohol is in the home and under adult supervision. Biomedical evidence is, not surprisingly, less comforting. Alcohol as a stimulus in conditions of stress can lead to high-risk behaviors in young people. Alcohol dependency may come faster than for adults. I will comment later on cultural considerations.

Taken together, these papers offer much food for thought and suggest the need for a subtle and nuanced public policy response to the issues. Subtlety and nuance, of course, do not always rank prominently in the political terms of trade.

Key issues

What are the key points from these papers that strike this policy observer?

The first point to come through loud and clear – and this will surprise no one – is the social and cultural importance of alcohol through almost all societies. Islamic culture is obviously different, for well-understood reasons. Even here, however, we may expect significant variations in practice through different strands of Muslim thinking and between different state forms, just as we might expect to see pressures of modernization and globalization have some impact. The United States in its more restrictive rules on access by young people is a curious outlier.

Yet the main issue here is that consumption of alcohol is quite a different issue than, say, drug addiction. The state, setting aside the Islamic exception, is not in the business of banning it. Correspondingly, if it proposes a different set of rules for young people than for the population at large, these rules need a measure of assent from young people and need to avoid the appearance of double standards.

The second key point, arising from Marie Choquet's paper, is that patterns of consumption among young people are clearly influenced by the wider cultural environment in which they find themselves. Hence, one sees the dramatic difference, familiar to Europeans, between the apparently healthy early drinking experiences of Southern or Mediterranean Europe and the more intensive or excessive drinking more common in Northern Europe. It is interesting to note how these early experiences are seen to influence later drinking behavior, with Mediterranean drinking declining as people grow older, but the opposite happening in Northern Europe.

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What are we to make of this? An obvious question is, if cultural background can make such a decisive difference for the better in Southern Europe, is it possible to recreate that culture, or relevant aspects of it (if we are confident we know what they are) in the North?

However, a third key point to note, though only referred to briefly in these papers, is the effect of globalization. In alcohol consumption, as in many other aspects of life, the world is becoming more uniform. This effect is perhaps most obvious in matters of personal consumption and in matters of fashion that are of greatest interest to young people. Advertising and branding are becoming increasingly global, influencing both what people drink and how and under what circumstances they are doing their drinking. What conclusions can we draw on future trends? At the very least, we cannot be confident that the Southern or Mediterranean model will win out!

The medical consequences of early drinking, discussed by Linda Spear, are also the key. This discussion is bedeviled by the ethical difficulties of experimenting on people and, at least to this lay commentator, by questions on the transferability of conclusions drawn from work on other species. Nevertheless, it is reasonably clear that early alcohol consumption, including indirect consumption in the womb or via breast milk, can have important long-term consequences. There is, therefore, a clear case for restricting access to alcohol by young people as a matter of public policy, even if it is not so easy to draw hard and fast rules, for example, on minimum legal age.

One further issue that strikes me as important, is that of the “gateway” effect, i.e., the assumption that initiating one substance leads to the initiation of another. This has been the classic argument in drug policy for banning cannabis as well as hard drugs, about which there is much dispute. Does the argument apply to alcohol in the sense that early introduction in itself predisposes a person to later problem drinking? The evidence is not clear, though if it were, this would of course point to more restrictive rules on early access.

How should Government respond?

Against this background, where do these three papers lead policy makers?

It seems clear that, at least in developed societies, we are faced with a problem of growing alcohol consumption and growing risk of serious consequences, both for societal functioning and for future patterns of ill health. It seems a fair bet that, with increasing affluence and trends of globalization, there are corresponding risks for developing societies. It is then logical to look at patterns and trends among young people.

The important social role of alcohol in most cultures is perhaps the key consideration. Government has to recognize, as it generally does, that it cannot respond to alcohol problems in the same way as to, say, drugs. Prohibition and restrictive rules are, no doubt, appropriate up to a point in order to establish a sensible framework. The framework itself needs to be understandable and rational and to enjoy general support. But even then, rules do not – other than, possibly, in the very long term – change cultural attitudes and behavior.

It seems difficult to argue for much beyond this. There seems to be no good case for rules that cannot be enforced effectively, which simply discredits them, or that do not clearly and closely relate to the desired objective, which makes them difficult to understand and accept, or that purport simply to regulate personal behavior when it does not impinge on others, which creates resentment and raises libertarian issues. Specifically, there is no strong case for laws or rules on young people drinking at home under parental supervision, or for wider restrictions on adults buying alcohol to take home, or for more restricted opening hours for bars. There is, of course, an argument that individuals should be protected from themselves where self-harm, as through excessive drinking, is likely to lead to social costs for others: for example, in the form of family disruption, economic inefficiency, or health treatment costs. These arguments do not appeal to me, but it is really a question of philosophical outlook and confidence, or a lack thereof, in the good intent and common sense of government.

So what should rules try to achieve?

- Restriction of sales to young people (either to take away or to drink on the premises).
- Defense against danger to others (as in, for example, rules on drinking and driving).
- Upholding of public order (as in setting management standards for bars, banning alcohol at football games,

etc.).

Interestingly, a recent review of licensing laws governing the sale and serving of alcohol in Scotland seems to have concluded against more restrictions of just this kind, but argued for better training of bar staff, tighter restrictions on license holders (e.g., requiring them to exercise better discretion on whom they serve), and a greater voice for the local community in licensing decisions (Scottish Executive, 2001). This report needs closer study but seems to adopt a liberal approach and relies for its objective on making drinking a more “social” activity. In other words, and despite acute problems of alcohol consumption in Scotland, it seems to acknowledge the limitations of the rule-based approach and seeks to change the culture. That, at least in the Northern European countries with the main alcohol-related problems, seems to be the right tactic.

Changing culture

But then, how do we change the culture and encourage the more Mediterranean approach to drinking? The Government in the United Kingdom in recent years has gotten heavily into social engineering of all kinds. Here in Scotland, Ministers seem to believe that they can decisively change society through endless initiatives to encourage people to take more exercise, to eat better diets, to avoid drugs, to engage in more responsible sex, to be better neighbors, to rely more on public transport, to be more personally ambitious, etc. – and, of course, to drink less. Throughout the United Kingdom, there is some schizophrenia about all this, since the same Ministers want to put more people in prison, take powers to punish parents for the sins of their children, and so on.

The common thread in all this is the painful recognition of fragmentation and breakdown in large that social problems cannot always be narrowly defined. While young people need advice and information about the effects and risks associated with alcohol, it is not clear that this comes best from government. My close involvement in various Scottish public health initiatives referred to above has convinced me of two important points.

First, Government and its agencies are not well-regarded by young people, and advice from them can at best be disregarded, and at worst be counterproductive. But second, health professionals continue to be held in high regard, and advice from them is treated as authoritative.

Of course, the biggest potential influences for changing cultural attitudes lie within forces that most shape the culture in the first place. This means the producers, or more particularly their marketing and image-makers, and, perhaps, even more so the hospitality industry that provides the immediate context in which much of the early drinking, at least in Northern Europe, takes place. These are outside the scope of the present papers, but point to the need for close and constructive relations between government and industry swatches of our society, and the uncertainty between well-meaning and benevolent responses on the one hand and the more authoritarian ones on the other.

This seems to be the better context in which Government, at least, should consider a specific issue such as underage drinking. It is not an isolated problem, but is likely to be part of a wider pathology of society - or of sections of society - that needs to be addressed in a more holistic way. This may mean more integrated and proactive policies for the socially disadvantaged, who certainly need more focused and proactive medical services within which advice and help on alcohol problems would fit well. It may mean more imaginative approaches to reengaging young people with society. The current youth culture of clubbing and heavy drinking, certainly in the United Kingdom, seems to be about more than just another way to have a drink. Whatever the answer, alcohol problems – whether or not in young people – are better seen as part of a larger problem, rather than as a problem all on their own. This means addressing the bigger issues. If society is ambitious for young people and cares for their welfare, it is easier to persuade young people to respond.

Conclusions

Excessive alcohol consumption by young people can clearly cause immediate risk and lasting damage. Northern European patterns of consumption by young people give cause for concern. But for most young people, early drinking does not seem to be a problem. There are other models of consumption than that of Northern Europe and further thought is needed on how to encourage those. Government’s best contribution seems likely to be in its broader policies to tackle the wider social problems of modern society, of which underage drinking is only a part.

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“The question we need to ask is not how we can regulate and control the use of alcohol... [but how] different societies have successfully integrated the healthy use of alcohol into their social, religious and family life, and the lessons we can learn from this.”

Reference

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