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on the Risky Behavior of Young People

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ABSTRACT

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We analyze the effect of growing up on welfare on young people's involvement in a variety of social and health risks. Young people in welfare families are much more likely to take both social and health risks. Much of the apparent link between family welfare history and risk taking disappears, however, once we account for family structure and mothers' decisions regarding their own risk taking and investment in their children. Interestingly, we find no significant effect of socio-economic status *per se*. Overall, we find no evidence that growing up on welfare causes young people to engage in risky behavior.

JEL Classification: J13, I38, J18

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1. Introduction

Adolescence is often characterized as a time for taking chances. Exploring one's boundaries, participating in new activities, forming new social networks, and adopting unfamiliar roles are all a normal part of the transition to independent adulthood. Most young people will successfully negotiate this transition. After all, psychologists note, the ability to regulate intense emotions, distinguish feelings from facts, reason, make decisions, and solve problems also improves throughout adolescence (Brynes 2003; Smetana and Turiel 2003) implying that occasional experimentation does not necessarily lead to enduring problem behavior (Steinberg and Morris 2001). At the same time, some adolescents will engage in a raft of risky behaviors that have potentially long-term consequences for their health and economic well-being (ABS 2008; Gruber 2001a). The consumption of alcohol, tobacco, or illicit substances, for example, is not only unhealthy, but in some cases addictive implying that the choices made while one is young may have permanent long-run health effects. Similarly, the decision to participate in crime, run away from home, or engage in unprotected sex can have (perhaps unintended) consequences that limit young people's options for completing their education and beginning a career. Given this, it is particularly important for policy makers and researchers to identify those factors underlying adolescents' decisions to take unhealthy and dangerous chances.[1]

This paper contributes to a growing economics literature that seeks to understand the relationship between socio-economic disadvantage and young people's

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[1] Risk taking is relatively common among youths. The Australian Bureau of Statistics (2008) estimates, for example, that in 2007 one in five (19 percent) men and one in six (16 percent) women aged 18 – 24 reported engaging in regular risky/high risk drinking. Moreover, this behavior appears to have important consequences. Teenagers (15 – 19) have the highest hospital separation rates due to alcohol intoxication, while young people aged 20 – 24 are more likely than people in other age groups to appear in court charged with driving while under the influence of alcohol or drugs. Transport deaths account for 31 percent of all deaths among those aged 15 – 24, but only one percent of all deaths among those over the age of 25.

risky behavior. Specifically, we use unique administrative data matched to survey data for 18-year olds and their mothers from the Youth in Focus (YIF) Project to estimate the effect of growing up on welfare on young people's decisions to take a variety of social and health risks.

We extend the previous literature in several important ways. First, our administrative data allow us to construct measures of the timing and intensity of welfare receipt, not at a point in time, but over the course of a young person's childhood. This is important as youth outcomes are linked to both the timing and duration of disadvantage (Duncan and Brooks-Gunn 1997; Berzin *et al.* 2006). Second, we pay particular attention to minimizing the potential for selectivity bias to confound interpretation of the effect of family welfare history on youths' risk taking. Specifically, we begin by using our detailed survey data to estimate a series of models increasing in controls for demographic characteristics, family background, and parental behavior. The inclusion of a comprehensive set of controls reduces the potential bias due to unobserved heterogeneity.[2] We then estimate a number of bivariate probit models in order to evaluate the sensitivity of our estimates to any remaining selection on unobserved characteristics. Finally, by analyzing multiple social and health risks, we are able to assess whether certain family characteristics appear to be related to risk taking generally or are more closely linked to specific types of risk. This goes some way towards allowing us to consider risky behavior in a more unified framework (see Gruber 2001b; Cardosa and Verner 2007).

Our results indicate that young people in welfare families are much more likely to take both social and health risks. Much of this apparent link between family welfare history and risk taking disappears once we control for the effects of family

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[2] Painter and Levine (2000), Waldfogel *et al.* (2002), Ruhm (2004), Antecol and Bedard (2007), and Cardosa and Verner (2007) adopt a similar approach in analyzing youth outcomes.

structure and mothers' decisions regarding their own risk taking and investment in their children. Interestingly, we find no significant effect of socio-economic status *per se*. In some cases, welfare receipt continues to have a significant effect on risky behavior despite extensive controls. However, sensitivity analysis indicates that this is likely to be the result of unobserved heterogeneity. Overall, we find no evidence that growing up on welfare causes young people to engage in risky behavior.

2. Welfare and Risk Taking

A large literature documents the way that a lack of financial resources, in particular family income, affects the life choices of children and adolescents. Poverty and/or the receipt of welfare have been linked to a range of detrimental outcomes including lower cognitive ability and academic achievement, worse mental and physical health, delayed social development, and poorer labor market performance in early adulthood.[3] Poor adolescents also take more chances. Young people from poor families are more likely to have early and unprotected sex, experience adolescent pregnancy, engage in delinquent acts, be arrested, and drop out of school (Duncan and Brooks-Gunn 1997; Haveman and Wolfe 1994; 1995; Harris and Marmer 1996). Clearly there is a case for being concerned about the effects of poverty on adolescent development including risk-taking behavior. At the same time, although evidence is mounting regarding the differential effects of growing up in a work-reliant versus a welfare-reliant family on the outcomes of poor adolescents (Bizin *et al.* 2006; Levine and Zimmermann 2004; Peters and Mullis 1997; others), there remains much that we do not know about the effects of public assistance *per se*. Most importantly, it is not

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[3] See Berzin *et al.* (2006), Duncan and Brooks-Gunn (1997), Harris *et al.* (2002), Haveman and Wolfe (1994; 1995), Mayer (1997) for extensive reviews.

at all clear that any correlation in welfare receipt and risk taking represents a causal relationship.[4]

Both the incidence and determinants of risk taking vary with gender. Adolescent girls and boys appear to have different reactions to stressful events (especially within the family) leaving boys more likely than girls to engage in a range of risky behaviors, while girls are often over-represented among those with depression, anxiety, or somatic complaints (see Abbott-Chapman *et al.* 2008). Among adolescent boys, risk taking is mainly related to orientation towards their peer group, however, for adolescent girls risky behavior is more closely linked to their relationships with their parents (Michael and Ben-Zur 2007).

The propensity for taking risks is also related to a number of other demographic and family characteristics. Firstborns have a lower propensity for risky behavior than do those with a higher birth order (Argys *et al.* 2006), while spending more time living with a biological father appears to reduce risk taking (Antecol and Bedard 2007). Not surprisingly, young people are also influenced by the risks their parents take. A number of studies, for example, suggest that there is a strong relationship between parental tobacco or alcohol consumption and the uptake of smoking and drinking by adolescents (see Bantle and Haisken-DeNew 2002; Powell and Chaloupka 2005; Li *et al.* 2002; Su *et al.* 1997). More surprising is the finding that parental risk taking in the form of smoking, drinking, or not using seat belts can also be linked to unrelated risks such as adolescent sexual activity (Wilder and Watt 2002). Finally, previous research suggests that affective and supportive parenting can

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[4] In particular, it is important to account for the potential endogeneity of welfare receipt. Exploiting instrumental variables, sibling differences, and child-specific effects, Levine and Zimmerman (2004), for example, find little evidence that maternal welfare receipt has a causal effect in reducing cognitive ability or leading to behavior problems. Similarly, once endogeneity is taken into account, Peters and Mullis (1997) find a negative effect of welfare only on labor market outcomes. Moreover, welfare is estimated to have a positive effect on achievement test scores and completed education for black adolescents.

mitigate the negative consequences of socio-economic disadvantage (Harris and Marmer 1996; Hanson *et al.* 1997) and it seems reasonable to expect that the number and types of chances that adolescents take will also be related to the parenting they experience.

After calls for an expanded research agenda surrounding youth risk taking (Gruber 2001b), the nature of the relationship between alternative forms of risky behavior has begun to receive more attention from researchers. The concern is that the act of engaging in one risky behavior (say binge drinking) may lead to an increased tendency to take other risks (for example, to engage in unprotected sex) compounding the cost of making a bad choice. Although the presence of a strong correlation in risk behaviors has been well established in the literature,[5] the potential for reverse causality and unobserved heterogeneity makes estimating the causal effect of one risk behavior on another methodologically challenging. Rees *et al.* (2001) note, however, that overcoming this methodological hurtle is fundamental for the design of sensible policy. On one hand, a causal relationship could imply that initiatives that were successful in reducing substance abuse would have far-reaching benefits by reducing unplanned pregnancies and sexually-transmitted diseases as well. On the other hand, if the correlation in risk behaviors stems from unobserved heterogeneity in the propensity for taking risk generally, it is possible that policies which raise the costs of one form of risk taking may have unintended consequences as youth substitute another.

While the methodological issues continue to be debated (see Rashad and Kaestner 2004), most researchers agree that to date there is little evidence of a causal link between alternative forms of risk (Grossman and Markowitz 2005; Grossman *et al.*

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[5] Rashad and Kaestner (2004) and Grossman *et al.* (2002) review the literature which links drug and alcohol use to sexual activity, while Harris *et al.* (2002) discusses the literature linking illicit drugs, delinquent behavior, and violence.

2002; Rashad and Kaestner 2004; Rees *et al.* 2001; Sen 2002). Rather the observed correlation in a variety of social and health risks seems to stem from individual-specific differences in the propensity to take risks. This suggests that more progress might be made by analyzing a large number of risk-taking behaviors simultaneously. Consequently, this paper contributes to a small, but growing, literature which seeks to examine a broad range of risky behaviors in a unified framework (see Antecol and Bedard 2007; Cardosa and Verner 2008).

3. Estimation Strategy

We begin with a simple conceptual framework in which a young people's decisions to take chances are driven by the anticipated costs and benefits of their actions.[6] In particular, if at time *t* an individual chooses to engage in some risky behavior (say, consume illicit drugs) with probability p_t a bad outcome occurs (say, an overdose) leading to a discounted, life-time utility of U_t^B. With probability $(1 - p_t)$, however, a bad outcome does not occur resulting in a discounted, life-time utility of U_t^{NB}. Youths are assumed to engage in a risky behavior if and only if

$$p_t U_t^B + (1 - p_t)U_t^{NB} > U_t^A \tag{1}$$

where U_t^A represents the discounted, life-time utility associated with not engaging in the risky behavior at all and we assume that $U_t^B < U_t^A < U_t^{NB}$. In this context, growing up on welfare could influence risk taking either by altering payoffs (for example, by lowering U_t^A) or by affecting the probability that a bad outcome occurs (perhaps because health services are worse in welfare neighborhoods). Of course, youths are unlikely to know p_t with certainty. Moreover, the calculation of the life-

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[6] This framework builds on the seminal work of Becker (1968) and has been widely adopted in the literature on crime and risk taking more generally.

time, discounted utility associated with various alternatives is complex involving both discount rates as well as expectations about the time path of future costs and benefits. These complexities open up the possibility that a family history of welfare receipt may also influence risky behavior by affecting youths' perceptions of risk, time preferences, or even the ability to rationally compare the future tradeoffs inherent in current choices.[7]

Although the discussion has been useful in highlighting the numerous ways in which growing up on welfare might influence young people's decisions to take risks, we are unable to estimate equation (1) directly. We therefore focus attention on the following reduced form model of young people's propensity for risk-taking behavior (Y_{ij}^*):

$$Y_{ij}^* = \alpha + W_i\beta_j + X_i\delta_j + \varepsilon_{ij} \qquad (2)$$

where i indexes individuals, $j = 1 \ldots 6$ indexes our measures of social and health risk, W_i captures the timing and intensity of the family's welfare receipt while the young person was growing up, X_i is a vector of controls for demographic, family background, and parenting characteristics that are related to risk taking, and α, β, δ are parameters to be estimated. In this framework, $\hat{\beta}$ captures the total direct effect of welfare on risk taking through all its various channels. Finally, $\varepsilon_{ij} = e_{ij} + \mu_i$ where μ_i reflects the effects of individual- or family-specific factors otherwise not accounted for in the model and e_{ij} is a random error term.

The propensity to engage in risk is unobserved, so we create an indicator variable reflecting the incidence of reported risk taking. Specifically,

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[7] O'Donoghue and Rabin (2001) review the recent literature that combines psychology and economics in an effort to understand the risky behavior of youth.

$$\Pr(Y_{ij} = 1) = \Pr(W_i \beta_j + X_i \delta_j + \varepsilon_{ij} > 0) = \Phi(Q\gamma) \qquad (3)$$

where $Q = (W_i, X_i)$, $\gamma = (\beta, \delta)$ are parameters to be estimated and Φ is the standard normal cumulative density function. Finally, we assume that $\varepsilon_{ij} \sim N(0,1)$.

The primary methodological difficulty in estimating equation (3) is to isolate the exogenous effects of welfare histories from the effects of unobserved family-specific factors (μ_i) that are correlated with both the family's welfare receipt (for example, poverty or socio-economic status) and the youth's propensity to take risks. In particular, in a model with a limited set of controls in X_i, the omission of important family-background characteristics could result in $COV(W_i, \varepsilon_{ij}) \neq 0$. This would imply that standard regression techniques will produce biased estimates of the effect of growing up on welfare on risky behavior $(\hat{\beta}_j)$.

We have several strategies for dealing with this potential problem. First, we use the detail of the Youth in Focus data to control for an extensive set of demographic, family background and parenting variables (see the discussion below) in order to ensure that (conditional on X_i) W_i is orthogonal to ε_{ij}. Previous researchers have adopted a similar approach in analyzing the determinants of youth outcomes more generally (Painter and Levine 2000; Waldfogel *et al.* 2002; Ruhm 2004; Antecol and Bedard 2007; and Cardosa and Verner 2007). Second, we estimate bivariate probit models that account for the possible correlation in the unobserved determinants of a youth's risky behavior and his or her family's welfare history. Following Maurin (2002), these models are identified using information about the socio-economic status of grandparents (as reported by parents) as exclusion restrictions. Finally, we adopt an empirical approach recently proposed by Altonji *et*

al. (2005; 2008) to gauge the sensitivity of our results to varying degrees of selection on unobserved characteristics.

4. The Youth in Focus Data

We use data from the Youth in Focus project (YIF) to estimate the relationship between a young person's decision to engage in risky behavior and the socio-economic disadvantage he or she experienced while growing up.[8] Our measure of socio-economic disadvantage is derived from the timing and intensity of his or her family's welfare receipt (see the discussion below). The YIF data are unique in providing detailed information about welfare histories, family background and parental behavior for a matched sample of mothers and their 18-year-old children.

(i) The Estimation Sample:

Specifically, the YIF Project uses Australian administrative social security records to identify all young people born in the six-month period between October 1987 and March 1988 who ever had contact with the social security system between 1993 and 2005 (see Breunig *et al.* 2007 for details). The Australian social security system is nearly universal for families with children with some payments such as the Child Care Benefit having no income test at all and others, such as the Family Tax Benefit, being denied only to families in the top quintile of the income distribution.[9] At the other extreme are welfare payments that are targeted towards low-income parents (mainly single parents) or unemployed individuals which are also subject to income, asset and/or activity tests. Young people can appear in the administrative data if they

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[8] For more information about the project see http://youthinfocus.anu.edu.au.
[9] The Family Tax Benefit is essentially an income tax credit to families with children. Currently, a family with two children would receive a Family Tax Benefit for incomes up to $105,000 AUD. See Centrelink (2007) for more information about the Australian social security system.

receive benefits themselves. Most, however, appear in the data because a family member (usually a parent) received a payment at some point between 1993 and 2005 which depended in part on his or her relationship to the youth. Comparisons of the number of young adults in these administrative data to census data suggests that over 98 percent of young people born between October 1987 and March 1988 are represented in the administrative data (Breunig *et al.* 2007). Thus, these social security records provide high-quality, fortnightly data on the payment details for the universe of Australians receiving a wide range of social benefits.

We summarize a family's welfare history by using the administrative data to categorize youths and their parents into one of six groups depending on the timing and intensity of the family's welfare receipt. The Australian government does not consider either the Family Tax Benefit or the Child Care Benefit to be welfare payments—a perspective which we also adopt. To place these payments in context, similar benefits in the United States are provided to families through the U.S. tax system in the form of standard deductions for dependent children and child care rebates. Fully 40.9 percent of families with children never receive welfare benefits and appear in the administrative data only through their family tax and child care benefit records.

At the other extreme are the 27.5 percent of families that received a welfare payment for a total of six years or more (who we classify as having had an intensive exposure to welfare) and the 31.6 percent of families that had more limited exposure to the welfare system at some point in the previous 12 years (see Appendix Table 1 for more details). The most common welfare benefits in this population are benefits for the unemployed or low-income parents. Specifically, unemployment benefits (Newstart Allowance), payments to low-income parents with children (Parenting

Payment Single or Parenting Payment Partnered), and disability payments (Disability Support Pension) are targeted towards the poor and are considered to be welfare. In particular, unlike the case in the United States, in Australia unemployment benefits represent welfare rather than an insurance scheme. Newstart Allowance is income-, asset-, and activity-tested and is not time-limited or related to an individual's previous earnings history (Centrelink 2007).

A stratified random sample of young people and a corresponding parent or guardian—in 96.5 percent of cases the biological mother—was selected from the administrative data for interview. Data from separate phone interviews with youths and their parents as well as a self-completion questionnaire administered to youth were then matched to the administrative social security data.[10]

We have necessarily made a number of sample restrictions. We drop 74 pairs in which the responding parent was not the biological mother and 504 pairs in which the youth did not complete a self-completion questionnaire or in which either the youth or the mother provided incomplete information. Consequently, our estimation sample consists of 1852 pairs of youths and their mothers who both have complete survey information for the variables of interest.[11]

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[10] The survey response rate was 36.4 percent for parents, and 36.1 percent for youth—73.1 percent of whom also completed the self-completion questionnaire. More than 96 percent of young people and 92 percent of parents completing the survey consented to having this information linked to their administrative records.

[11] Following best practice (Groves *et al.* 2004), approach letters, incentive payments, repeated call backs, and Computer Assisted Telephone Interviewing (CATI) were all used to maximise response rates. Although the final response rate differed somewhat across strata – ranging from approximately 40 percent in stratum A to 31 percent in stratum B – these differences stem primarily from differences in contact rates rather than refusal rates (Breunig *et al.* 2007). We investigated the potential for survey non-response and sample selection to bias our estimates of the effect of welfare history on risky behavior. First, we analysed our administrative data to assess whether the observed characteristics of youths who have completed the survey were different from those who refused to participate or were uncontactable. The results indicate that the youths receiving public assistance (specifically Youth Allowance) and youths living in urban areas are somewhat over-represented in our sample. To the extent that risk is higher in urban areas, this may lead our estimates to overstate the effect of socio-economic disadvantage on risky behavior. Second, we considered a somewhat narrower question of whether the youths who returned the self-completion questionnaire (SCQ) are likely to be different to those who did not. Since all of our measures of risky behavior are taken from the SCQ, we cannot

(ii) Measuring Risk-Taking Behavior and Classifying Family Welfare History

The youths in our sample were asked a series of questions about a range of social and health risks that they may have taken while growing up. Specifically, individuals were asked whether they had ever: 1) run away from home; 2) been in trouble with police (attended juvenile court); 3) hung out with a bad crowd; 4) smoked cigarettes; and 5) tried marijuana. In addition, information was collected about the amount and frequency of alcohol consumption allowing us to construct a measure of risky drinking.[12] Indicator variables (Y_i) constructed from respondents' reports of these six risky behaviors form the basis of our analysis.

We classify young people on the basis of their families' welfare histories as follows: 1) those in families with no history of welfare (non-recipients); 2) those in families that received welfare for more than six years while the youth was growing up (intensive support); 3) those in families receiving less than six years of support after 1998 (late moderate support); and 4) those in families receiving less than six years of support some of which occurred before 1998 (early moderate support). This categorization allows us to make comparisons between those receiving intensive, moderate, and no welfare as well as to consider the relative importance of exposure to

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directly assess any possible differences in risk-taking of those who did not complete the SCQ. However, the main survey contained one question on regular smoking behavior. Using this information, we find no evidence that girls who did not provide a SCQ are any different in their smoking behavior than girls who did. Boys who returned the SCQ were significantly less likely to be smokers, however, this can be captured by a simple shift parameter. There is no significant interaction between the smoking indicator and other characteristics. Taken together, we believe that these results indicate that there is little reason to believe that we have understated the effect of growing up on welfare on the propensity to take risks.

[12] High-risk drinking for young people is defined so as to reflect Australian National Health and Medical Research Council (2001) guidelines as closely as possible. Women are considered high-risk drinkers if they consumer seven or more standard drinks per occasion, no matter how frequently; or five – six drinks at least five days per week. Men are considered high-risk drinkers if they consume 11 or more standard drinks per occasion, no matter how frequently; nine or ten standard drinks at least five days per week; or seven or more drinks every day.

moderate welfare early in life (before the youth was 10 years old) and exposure to moderate welfare later in life (after age 10).[13]

Table 1 documents risk-taking behavior of the 18-year olds in our sample.[14] There are striking disparities in the incidence of social and health risk taking among youth growing up in different socio-economic circumstances. Young people in families with a history of intensive welfare receipt are significantly more likely than those in non-welfare families to have taken a wide range of social and health risks while growing up. For example, one in five youths in intensive welfare families have ever run away from home, while fully 40.4 percent have tried marijuana. The incidence of running away (11.7 percent) and marijuana use (32.1 percent) is substantially lower among youths in families with no history of welfare receipt. In fact, the disparity in risky behavior between these two groups of young Australians is substantial (and statistically significant) irrespective of the measure of social and health risk that we consider. At the same time, there are no significant differences in the risk taking of young people whose families received moderate welfare after the age of 10 and those who have never received welfare. Those exposed to moderate welfare before the age of 10, however, are significantly more likely to have at some point hung out with a bad crowd, smoked cigarettes, or tried marijuana than youth in non-welfare families, though differences in other risk behaviors are not significant. Taken together, these results suggest that it is the intensity and timing of socio-economic disadvantage, rather than its incidence, which is relevant for youths' risk taking.

Table 1 Here

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[13] In those families receiving intensive support, the first incidence of welfare receipt always occurs before 1998 when the child was aged 10.

[14] These results are weighted to take into account different sampling probabilities.

There also appears to be a gender dimension to risk taking with young men being significantly less likely than young women to report ever hanging out with a bad crowd but significantly more likely to have ever been in trouble with police or attended juvenile court. Moreover, the relationship between family welfare history and risk taking differs by gender. The gender gap in hanging out with a bad crowd is concentrated among young people in non-welfare families for example. The descriptive results discussed above suggest that the link between socio-economic disadvantage and risky behavior is complex and appears to depend on both gender and the nature (i.e., intensity and timing) of disadvantage experienced.

5. Estimation Results

We begin by repeatedly estimating equation (3) with expanding sets of controls in order to gauge the sensitivity of the estimated effect of family welfare history to the inclusion of additional determinants of risk taking. Stability of these estimates would provide some reassurance that the conditional independence assumption (i.e. $COV(W_i, \varepsilon_{ij}) = 0$) required to identify any causal effect of welfare history on risky behavior is justified. Our goal is to account for those factors underlying a youth's propensity to engage in risky behavior (see Section 2 for a review) which may also be related to his or her family welfare history. At the same time, we wish to avoid the inclusion of endogenous regressors which themselves are determined by a family's welfare history (see Ruhm 2004).

Given this, we consider three alternative specifications. The first controls only for the demographic characteristics of the youth and his or her parents (X_i).[15] The

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[15] Specifically, we include indicators for the following: youth's indigenous status, youth's immigration status (separately by English-speaking background), urban residence, mother's indigenous status, mother's age, and whether either parent is an immigrant (separately by English-speaking background).

second adds the controls for family background including family structure as well as the educational attainment and occupational status of both parents.[16] The final specification also adds controls for whether parents read to the youth when he or she was young as well as mother's risk taking behavior, i.e. smoking and risky drinking.[17] Results (probit marginal effects and z-statistics) for the likelihood that young people have engaged in a variety of social (Table 2) and health risks (Table 3) while growing up are presented separately for young women (Panel A) and young men (Panel B). Summary statistics are provided in Appendix Table 1.

(i)   The Impact of Family Welfare History on Social Risks

We find that having a family history of welfare receipt is generally associated with a significantly higher probability of engaging in social risk in the baseline model (see Table 2). In particular, growing up in a family with a history of intensive welfare receipt is associated with a significantly higher propensity for young women to have run away from home (9.2 percentage points), been in trouble with police/attended juvenile court (13.6 percentage points), and have hung out with a bad crowd (9.9 percentage points). Young men growing up in welfare-intensive families also are substantially more likely to take these same risks though the magnitude of the effect differs across genders. Clearly, the disparity in social risk across socio-economic groups observed in Table 1 is not due to differences in the demographic characteristics of youths or parents in these groups. Moreover, the dearth of

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[16] This specification adds controls for the total number of children born to the youths' mother as well as indicators for whether parents ever separated (separately by remarriage) and whether the youth ever lived without either parents. Educational attainment (separately for each parent) is controlled using indicators of secondary school (12 years) completion, diploma/certificate, and a bachelor's degree or more (the omitted category is less than 12 years). Occupational status is captured through the ANUO4 scale and we have included indicator variables for the lack of a reported occupation for both mothers and fathers (see Jones and McMillan 2000).

[17] In particular, we add indicator variables (0/1) for whether the youth reports that his or her parents ever read to them at night and whether the mother ever smoked or is a risky drinker.

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significant differences in the risk-taking behavior of youth growing up in families receiving moderate levels of receipt and those growing up in families receiving no welfare indicates that it is intensity rather than the incidence of welfare receipt that matters.

Table 2 Here

At the same time, the effect of intensive socio-economic disadvantage on social risk taking is substantially reduced (and is often eliminated) once we control for the effects of family background (see Column B). Specifically, the estimated effect of intensive welfare on young women's likelihood of having run away from home falls by more than half, while the effect on hanging out with a bad crowd essentially disappears. Young women from welfare-intensive families do remain significantly more likely to have been in trouble with police once family background is accounted for, however the estimated effect (8.9 percentage points) is substantially smaller than when family background is omitted from the model (13.6 percentage points). Similarly, young men from welfare-intensive families continue to be significantly more likely to have been in trouble with police (9.1 percentage points) or to have hung out with a bad crowd (10.5 percentage points) despite the additional controls for family background.

Once we add additional controls for parental behavior, we continue to find that intensive welfare receipt is associated with a substantially higher probability of engaging in some forms of social risk. Young women in welfare-intensive families are 63.0 percent more likely than similar young women in non-welfare families to have been in trouble with police/attended juvenile court, while the incidence of police/court interactions among young men in welfare intensive families is 43.8

percent higher. Young men are also 62.3 percent more likely to report having hung out with a bad crowd if their families received intensive welfare assistance.

Thus, although much of the disparity in the unconditional incidence of social risk taking stems from heterogeneity in family background and parental behavior across welfare categories, it appears that growing up in a family with a history of intensive welfare receipt is associated with taking certain social risks. Interestingly, there are no significant differences in the risk taking behavior of young people with more moderate exposure to the welfare system suggesting that welfare intensity rather than welfare incidence is more closely linked to risk taking behavior.

(ii)   The Impact of Family Welfare History on Health Risks

Consistent with our analysis of social risks, in the baseline model intensive socio-economic disadvantage is also associated with a higher likelihood of engaging in a number of health risks (see Column A Table 3). Young women and men growing up in families with a history of intensive welfare receipt are substantially more likely to have ever smoked cigarettes (10.5 and 15.7 percentage points respectively) or tried marijuana (9.6 and 8.1 percentage points respectively), while young men in welfare intensive families are also more likely to report risky alcohol consumption (10.1 percentage points). Disparity in the taking of health risks across socio-economic groups is not explained by the characteristics of youths and parents in these families.[18]

Table 3 Here

The effect of having a family history of welfare on the likelihood that young women take chances with their health is completely eliminated once we control for family background, however (see Column B). Similarly, there is no longer any effect

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[18] Note that the model for marijuana use also includes a control for living in South Australia, the ACT, Western Australia or the Northern Territory where marijuana use has been decriminalized for minor offences.

of welfare receipt on the likelihood that young men have ever tried marijuana once we account for family structure as well as the educational attainment and occupational status of mothers and fathers. On the other hand, young men in families with a history of intensive welfare receipt are substantially more likely to report risky alcohol consumption and ever smoking, although the effects are imprecisely estimated and only statistically significant at the 10 percent level. Adding controls for parental behavior reduces the estimated effect of having a welfare history on young men's probability of ever having smoked somewhat (rendering it no longer significant), but leaves the effect on risky alcohol consumption more or less unchanged (see Column C).

Taken together, these results provide at best mixed evidence that growing up on welfare is related to youths' propensity to take health risks once we control for the effects of family background and parental behavior. Only the effects on young men's alcohol and cigarette consumption are large enough to be meaningful once detailed controls are added to the model. But even here, our estimates are imprecise and not always significant at standard levels. Overall, taking health risks appears to be more closely associated with disparity in family background and parental behavior than with welfare receipt *per se*.

(iii) The Impact of Family Background and Parental Behavior on Risky Behavior
Before turning to our bivariate probit estimates of the effect of socio-economic disadvantage on risky behavior, we assess the ways in which family background and parental behavior are linked to youths' propensity to take both social and health risks. In particular, Table 4 presents the remaining estimates from specification C—our

most detailed model.[19] Marginal effects (and standard errors) are presented in the top part of the table, while results of standard F-tests of the joint significance of related variables are presented in the bottom of the table.

Table 4 Here

Consistent with Antecol and Bedard (2007), we find that youths, in particular adolescent girls, are more likely to take variety of social and health risks when their mothers separate from their natural fathers and do not repartner. For example, young women are substantially more likely to have ever smoked (15.6 percentage points) or tried marijuana (11.6 percentage points) if their natural parents are not together and their mothers remain unpartnered. It is important to note that these effects on young women's behavior are both sizeable and widespread. In particular, the estimated effect of having a single mother is insignificant only on young women's probability of having been in trouble with police/attended juvenile court. Among young men, living with a single mother is associated with a significantly higher probability of having hung out with a bad crowd, ever smoked cigarettes, or tried marijuana. At the same time, we also find that having a stepfather in the household leads to more risk taking. Thus, our results confirm previous findings that growing up with one's natural father decreases the propensity for risky behavior (Harris and Marmer 1996; Antecol and Bedard 2007).

Taken together our results indicate that family structure is an important determinant of youths' propensity to take both health and social risks. In particular, F-tests reveal that our measures of family structure are jointly significant in affecting risky behavior in 8 out of the 12 cases considered. The exceptions are that family structure is not significantly related to the probability that either young men or young

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[19] Estimates of the effect of family welfare history from these models, although estimated jointly, are reported separately in Tables 2 and 3 for convenience.

women report engaging in risky drinking. Family structure is also not related to the likelihood that young women have had contact with the criminal justice system or that young men have run away from home.

There is a much weaker relationship between a young person's risky behavior and his or her family's socio-economic status as measured by parents' education and occupational status. Specifically, having a mother with a high school degree (as opposed to a mother who left school before completing high school) is associated with a slightly lower probability that young women will have ever been in trouble with police/attended juvenile court or hung out with a bad crowd, while young women are more likely to have ever tried marijuana if their mothers are highly educated. However, there is no effect of maternal education on young women's likelihood of engaging in other types of risky behavior and mothers' educational attainment is not related to the risky behavior of their sons at all. Rather, young men's risk taking appears to be more closely linked to their fathers' education. Specifically, young men are less likely to run away from home or have been in trouble with police/attended juvenile court when their fathers have at least a Bachelor's degree. Young women are less likely to smoke, and young men are more likely to drink, when their fathers completed high school rather than leaving school earlier. These effects are often quite small, however, and F-tests indicate that parental education is never jointly significant in explaining youths' risk taking.

A young person's propensity to engage in risky behavior is also not in general related to his or her parents' occupational status. Having a mother or father who does not report an occupation is associated with an increased propensity for youth, in particular young men, to report some risky behaviors. However, our occupational status variables are generally not significant in explaining young people's decisions to

take risks. The exception is that young men's probability of running away from home is significantly related to their parent's occupational status.

Finally, we turn to the effects of parental behavior on the likelihood that young people take social and health risks. We find that reading to children is linked to a lower propensity of risky behavior in adolescence. In particular, young women whose parents read to them while they were young are less likely to have been in trouble with police/attended juvenile court by the time they turn 18, while young men are significantly less likely to have run away from home or hung out with a bad crowd if their parents read to them as a child. It is unlikely that these results reflect the lingering effect of reading *per se.* Rather, our parental reading variable to some degree controls for unobserved, time-invariant heterogeneity in parental involvement and supervision throughout childhood and adolescence. Consistent with Wilder and Watt (2002), we also find that maternal smoking is associated with a substantial increase in adolescent risk taking generally. Both young women and young men are significantly more likely to report having hung out with a bad crowd if their mothers ever smoked (6.8 and 5.4 percentage points respectively), while young women also have a higher probability of having been in trouble with police/attended juvenile court (5.2 percentage points). Considered together, these measures of parental behavior are jointly significant in explaining young people's decisions to take chances in 8 out of 12 cases. Thus, mothers' decisions with respect to their own risk taking and the extent to which they invest in their children have important implications for the probability that their children will engage in risky activities.

6. Discussion: The Potential Role of Unobserved Heterogeneity

Thus far, our results indicate that much of the apparent link between growing up on welfare and young people's propensity to engage in risky behavior disappears once we control for the effects of family structure, parental socio-economic status, and mothers' own risk-taking behavior. There are exceptions however. Despite the extensive list of controls, having a family history of intensive welfare receipt continues to be associated with a significantly higher probability that young women have ever been in trouble with police (or attended juvenile court) and that young men have been in trouble with police, hung out with a bad crowd, or engaged in high-risk drinking. In addition, there is a sizeable positive effect of intensive welfare receipt on young men's smoking behavior, though the effect is not quite significant at 10 percent. Thus, it is important to assess whether there is evidence that any of the effect of family welfare history on these outcomes is causal.

We use two alternative approaches to address this issue. First, we estimate bivariate probit models to account for any unobserved, family-specific heterogeneity affecting both youths' risk taking and their families' propensity to have a history of intensive welfare receipt. In particular, our data provide us with limited information about the socio-economic status of grandparents (as reported by mothers). We use this information as exclusion restrictions in models in which the socio-economic status of the older generation affects the outcomes of their children (i.e. mothers' welfare histories) but not the outcomes of their grandchildren (i.e. youths' risky behavior).[20] Second, we conduct two sensitivity tests suggested by Altonji *et al.* (2005; 2008) that can help us gauge the potential for selectivity on unobserved characteristics to be driving our results.

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[20] Maurin (2002) also uses information about grandparents to estimate the effect of parental income on children's school performance.

Selected bivariate probit results are presented in Table 5.[21] Our measures of the grandparent's socio-economic status—i.e., the grandfather's occupational status, an indicator of whether the family took regular vacations when the mother was aged 14, and indicators for having a deceased parent at age 14—are generally significant in predicting whether or not the mother has a history of intensive welfare receipt. The relationship is weak, however, suggesting that our exclusion restrictions may not be particularly powerful limiting the strength of the conclusions to be drawn (see Rashad and Kaestner 2004). Nonetheless, we find that having a family history of intensive welfare is not associated with increased risk taking once we account for correlation in risk taking and family welfare histories.[22] We reach similar conclusions when we consider the effect of any welfare history on youths' risky behavior.

Table 5 Here

Given the weakness of our exclusion restrictions, it is also useful to conduct the sensitivity analysis suggested by Altonji *et al.* (2005; 2008). Their approach provides an informal method for investigating the importance of selectivity bias when good instruments are not available. We first estimate a series of bivariate probit models making alternative assumptions about the magnitude of ρ, the correlation in the error components of the welfare history and risky behavior equations. Assuming that $\rho = 0$ is equivalent to estimating a single-equation probit model of risk taking assuming that welfare history is exogenous. Higher values of ρ are associated with

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[21] Specifically, we estimate bivariate probit models of the determinants of risky behavior using specification C and i) dropping indicators for moderate late and moderate early welfare receipt or ii) including an indicator of any welfare receipt. These more parsimonious specifications of welfare receipt allow us to make the best use of our limited information about grandparents. The results in Table 5 represent the models in which the excluded variables had the most power in predicting the family's probability of receiving intensive welfare.

[22] The exception is that a family history of intensive welfare continues to have a positive effect on young men's propensity to have hung out with a bad crowd. In this case, however, the excluded variable (grandfather's occupational status) is not significant in predicting welfare history. A family history of intensive welfare receipt is estimated to reduce (rather than increase) the probability that young women report ever interacting with the criminal justice system.

more correlation in the unobserved factors driving both risk taking and family welfare history. These results are presented in Table 6. We find that even a small amount of positive correlation, $\rho \geq 0.1$, is sufficient to completely eliminate the significant effect of family welfare history on risky behavior. We next follow Altonji *et al.* (2005; 2008) in calculating the ratio of selection on unobservables to selection on observables that would be required to completely explain the estimated effect of family welfare history on youth risk taking (see Table 7).[23] We find that if selection on unobserved characteristics is only one third (0.369) as large as selection on the observed characteristics all of our results could be explained by selectivity bias. Taken together, the results of these sensitivity tests – like those of the bivariate probit models in Table 5 – strongly suggest that any effect of welfare history on youths' risk taking that remains after controlling for family structure, parental socio-economic status, and mothers' own risk-taking behavior (see Table 3) is not causal, but rather potentially stems from other factors not accounted for in the analysis.

Tables 6 and 7 Here

7. Conclusions

While most young people successfully negotiate the transition from adolescence to independent adulthood, some will participate in a range of risky activities that can have long-term consequences for their health, educational attainment, and labor market opportunities. Those involved in the formation of social policy need to understand the ways in which economic and social disadvantage influence

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[23]Altonji *et al.* (2005; 2008) observe that the relationship between the endogenous variable and the mean of the distribution of the index of unobservables is λ times as strong as the relationship between the endogenous variable and the mean of the observable index $X'\gamma$ after adjusting for respective variances. Then, treating the binary variable model for the outcome variable as though the regression is carried out on the latent variable directly via the OLS and assuming that the OLS bias is close to the probit bias, they use the familiar formula for estimating a coefficient bias, which depends on the shift in unobservables. Finally, under the hypothesis that the true effect of the endogenous variable is 0, they are able to use the above observation find the value of λ.

adolescents' decisions to take unhealthy or dangerous chances. In particular, the appropriate policy response relies heavily on identifying which mechanisms are causal and which reflect correlation in background factors (see Rees *et al.* 2001).

This paper uses data from the Youth in Focus project to estimate the effect of growing up on welfare on young people's decisions to take a range of health and social risks. We find that although 18-year olds in welfare families are much more likely to take both social and health risks this relationship appears to be mainly due to the effects of family structure and the decisions that mothers make regarding their own risk taking and investing in their children. Socio-economic status *per se* has surprisingly little effect on a youth's propensity to take chances. In those instances in which welfare receipt continues to have a significant effect on risky behavior despite extensive controls it appears that this is most likely the result of unobserved heterogeneity. Overall, we find no evidence that growing up on welfare causes young people to engage in risky behavior.

These results lead to a number of important conclusions. First, it seems clear that for Australian youth the issue is one of economic and social disadvantage in the form of poverty, family disruption, limited family functioning, etc. rather than the receipt of public benefits *per se*. This is consistent with previous literature that finds that the source of income is relatively unimportant in understanding youths' life chances once the endogeneity of public benefits is taken into account (for example, Peters and Mullis 1997; Levine and Zimmerman 2005; Berzin *et al.* 2006). In the first instance, it seems sensible then for social policy to be centered squarely on providing adequate resources to families with children.

At the same time, it is also clear that financial resources are not a panacea to the problems associated with youth risk taking. Previous researchers have argued that effective parenting—in particular the involvement of fathers—can to some extent protect young people from the effects of economic and socio-economic disadvantage (Harris and Marmer 1996; Hanson *et al.* 1997). Policy initiatives that increased the employment of welfare mothers in the United States had positive consequences for younger children, but appear to have adversely affected adolescents—an effect which many have attributed to the reduction in the time that parents have to monitor and supervise their adolescent children (Gennetian 2004). Our results certainly support a role for parental behavior and decisions in young people's decisions to take risks with their own health and safety. This suggests that encouraging parents to adopt healthier life styles and become more effective parents may have positive consequences for their children as well.

Finally, despite the potentially long-term consequences of youths' decisions to engage in risky behavior, there remains much that we do not know about why some young people successfully negotiate the experimentation often associated with adolescence and others do not. Making progress in this area depends on future research initiatives that are specifically targeted towards the particular challenges that young people face.

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Table 1 Risky behaviors of youth: summary of outcome variables

Outcomes	Total unweighted		Total weighted		No income support		Intensive welfare		Moderate late welfare		Moderate early welfare	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
All youth[a]												
Ran away from home	0.149	0.36	0.148	0.36	0.120	0.33	**0.194**	0.40	0.146	0.35	0.144	0.35
Got in trouble with police or attended juvenile court due to offending	0.163	0.37	0.159	0.37	0.104	0.31	**0.252**	0.43	0.142	0.35	**0.152**	0.36
Hung out with a bad crowd	0.184	0.39	0.181	0.38	0.138	0.35	**0.249**	0.43	0.170	0.38	0.178	0.38
High-risk drinker	0.224	0.42	0.222	0.42	0.195	0.40	**0.264**	0.44	0.212	0.41	0.222	0.42
Ever smoked	0.295	0.46	0.290	0.45	0.233	0.42	**0.358**	0.48	**0.307**	0.46	**0.302**	0.46
Ever tried marijuana	0.362	0.48	0.359	0.48	0.320	0.47	**0.405**	0.49	0.330	0.47	**0.383**	0.49
No. of obs	*1,675*		*1,675*		*550*		*469*		*212*		*444*	
Girls												
Ran away from home	0.167	0.37	0.165	0.37	0.135	0.34	0.216	0.41	0.190	0.39	0.147	0.35
Got in trouble with police or attended juvenile court due to offending	0.122	0.33	0.119	0.32	0.072	0.26	0.197	0.40	0.086	0.28	0.121	0.33
Hung out with a bad crowd	0.205	0.40	0.204	0.40	0.171	0.38	0.259	0.44	0.181	0.39	0.204	0.40
High-risk drinker	0.246	0.43	0.245	0.43	0.220	0.42	0.270	0.44	0.224	0.42	0.266	0.44
Ever smoked	0.309	0.46	0.306	0.46	0.263	0.44	0.355	0.48	0.319	0.47	0.317	0.47
Ever tried marijuana	0.355	0.48	0.353	0.48	0.319	0.47	0.405	0.49	0.336	0.47	0.355	0.48
No. of obs	*921*		*921*		*304*		*259*		*116*		*242*	
Boys[b]												
Ran away from home	**0.127**	0.33	**0.128**	0.33	0.102	0.30	0.167	0.37	**0.094**	0.29	0.141	0.35
Got in trouble with police or attended juvenile court due to offending	**0.214**	0.41	**0.208**	0.41	**0.142**	0.35	**0.319**	0.47	**0.208**	0.41	**0.192**	0.40
Hung out with a bad crowd	**0.158**	0.36	**0.154**	0.36	**0.098**	0.30	0.238	0.43	0.156	0.36	0.152	0.36
High-risk drinker	**0.196**	0.40	**0.193**	0.40	0.163	0.37	0.257	0.44	0.198	0.40	**0.170**	0.38
Ever smoked	0.277	0.45	0.271	0.44	0.195	0.40	0.362	0.48	0.292	0.46	0.289	0.45
Ever tried marijuana	0.370	0.48	0.368	0.48	0.321	0.47	0.405	0.49	0.323	0.47	0.422	0.50
No. of obs	*754*		*754*		*246*		*210*		*96*		*202*	

[a] Means that are statistically different from the "no income support" category at 5% level of significance are in bold.

[b] Means that are statistically different from those for girls at 5% level of significance are in bold.

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Table 2   Socially risky behavior

	Ran away from home			Got in trouble with police or attended juvenile court			Hung out with a bad crowd		
	(A)	**(B)**	**(C)**	**(A)**	**(B)**	**(C)**	**(A)**	**(B)**	**(C)**
Girls:									
Intensive welfare	0.092***	0.040	0.038	0.136***	0.089**	0.075**	0.099***	0.017	0.001
	(2.72)	(1.07)	(1.00)	(4.27)	(2.53)	(2.18)	(2.73)	(0.41)	(0.02)
Moderate late welfare	0.062	0.026	0.023	0.021	0.002	-0.009	0.017	-0.015	-0.025
	(1.42)	(0.61)	(0.55)	(0.52)	(0.05)	(0.25)	(0.36)	(0.32)	(0.55)
Moderate early welfare	0.010	-0.005	-0.008	0.062*	0.047	0.038	0.036	0.014	0.005
	(0.31)	(0.15)	(0.24)	(1.95)	(1.47)	(1.21)	(0.99)	(0.37)	(0.15)
Basic youth demographics (8)	x	x	x	x	x	x	x	x	x
Parental family structure (4)		x	x		x	x		x	x
Parental SES (12)		x	x		x	x		x	x
Parenting (3)			x			x			x
Boys:									
Intensive welfare	0.060*	0.035	0.031	0.178***	0.091*	0.091*	0.165***	0.105**	0.096**
	(1.78)	(0.92)	(0.84)	(4.19)	(1.89)	(1.87)	(4.20)	(2.38)	(2.18)
Moderate late welfare	-0.015	-0.032	-0.030	0.080	0.044	0.045	0.078	0.042	0.044
	(0.36)	(0.79)	(0.74)	(1.47)	(0.80)	(0.83)	(1.56)	(0.88)	(0.91)
Moderate early welfare	0.026	0.014	0.010	0.055	0.007	0.006	0.065*	0.027	0.016
	(0.79)	(0.42)	(0.31)	(1.30)	(0.17)	(0.15)	(1.67)	(0.68)	(0.41)
Basic youth demographics (8)	x	x	x	x	x	x	x	x	x
Parental family structure (4)		x	x		x	x		x	x
Parental SES (12)		x	x		x	x		x	x
Parenting (3)			x			x			x

Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3   Health-risk behavior

	High-risk drinker			Smoker			Tried marijuana		
	(A)	**(B)**	**(C)**	**(A)**	**(B)**	**(C)**	**(A)**	**(B)**	**(C)**
Girls:									
Intensive welfare	0.050	-0.013	-0.027	0.105**	-0.027	-0.047	0.096**	0.010	-0.001
	(1.33)	(0.30)	(0.63)	(2.56)	(0.58)	(1.00)	(2.28)	(0.19)	(0.02)
Moderate late welfare	0.007	-0.032	-0.046	0.068	-0.004	-0.023	0.030	-0.006	-0.021
	(0.14)	(0.67)	(0.96)	(1.28)	(0.07)	(0.43)	(0.55)	(0.11)	(0.38)
Moderate early welfare	0.049	0.019	0.008	0.069*	0.029	0.012	0.051	0.030	0.018
	(1.29)	(0.49)	(0.20)	(1.65)	(0.68)	(0.28)	(1.19)	(0.67)	(0.41)
Basic youth demographics (8)	x	x	x	x	x	x	x	x	x
State decriminalised marijuana (1)							x	x	x
Parental family structure (4)		x	x		x	x		x	x
Parental SES (12)		x	x		x	x		x	x
Parenting (3)			x			x			x
Boys:									
Intensive welfare	0.101**	0.082*	0.087*	0.157***	0.099*	0.085	0.081*	0.020	0.001
	(2.56)	(1.80)	(1.89)	(3.47)	(1.87)	(1.59)	(1.73)	(0.36)	(0.02)
Moderate late welfare	0.060	0.032	0.031	0.104*	0.048	0.060	0.002	-0.041	-0.033
	(1.19)	(0.63)	(0.60)	(1.80)	(0.82)	(1.01)	(0.04)	(0.66)	(0.52)
Moderate early welfare	0.017	-0.002	-0.001	0.081*	0.031	0.014	0.095**	0.061	0.045
	(0.43)	(0.04)	(0.03)	(1.79)	(0.65)	(0.30)	(2.00)	(1.23)	(0.89)
Basic youth demographics (8)	x	x	x	x	x	x	x	x	x
State decriminalised marijuana (1)							x	x	x
Parental family structure (4)		x	x		x	x		x	x
Parental SES (12)		x	x		x	x		x	x
Parenting (3)			x			x			x

Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4   Complete results for full specification (C)

	Results for female sample						Results for male sample					
	Ran away from home	Police /juvenile court	Hung out with a bad crowd	High-risk drinker	Smoker	Tried marijuana	Ran away from home	Police /juvenile court	Hung out with a bad crowd	High-risk drinker	Smoker	Tried marijuana
Indigenous	0.009	0.086	-0.124	0.114	0.060	0.368***	-0.023	-0.018	-0.042	0.073	0.065	-0.083
	(0.09)	(0.99)	(1.35)	(0.98)	(0.47)	(2.68)	(0.31)	(0.19)	(0.51)	(0.72)	(0.57)	(0.69)
Immigrant from non-English speaking country	-0.061	-0.057	-0.091	-0.183*	-0.247***	-0.264***	0.029	-0.007	0.008	-0.036	0.032	0.037
	(0.89)	(1.01)	(1.12)	(1.83)	(2.74)	(2.64)	(0.34)	(0.07)	(0.09)	(0.36)	(0.30)	(0.31)
Immigrant from English-speaking country	-0.023	-0.010	-0.061	-0.066	-0.113	-0.158	0.057	0.319***	0.209*	-0.074	0.018	0.078
	(0.30)	(0.15)	(0.71)	(0.71)	(1.17)	(1.55)	(0.66)	(2.71)	(1.93)	(0.77)	(0.16)	(0.63)
Lives in urban area	0.038	-0.009	0.004	-0.040	-0.010	-0.017	-0.010	-0.032	0.038	-0.060**	-0.011	-0.070*
	(1.48)	(0.40)	(0.16)	(1.31)	(0.31)	(0.49)	(0.42)	(1.00)	(1.37)	(1.97)	(0.30)	(1.80)
Either parent is migrant from non-English speaking country	-0.001	0.001	-0.077**	-0.078*	-0.069	-0.050	-0.023	-0.029	-0.028	-0.116***	0.061	-0.012
	(0.04)	(0.05)	(2.06)	(1.92)	(1.56)	(1.07)	(0.65)	(0.65)	(0.76)	(2.74)	(1.22)	(0.21)
Either parent is migrant from English-speaking country	0.040	-0.007	-0.029	-0.005	-0.047	0.016	0.048	-0.011	-0.057*	-0.049	0.022	0.013
	(1.19)	(0.26)	(0.83)	(0.13)	(1.13)	(0.37)	(1.56)	(0.27)	(1.77)	(1.32)	(0.50)	(0.26)
Mother Indigenous	-0.073	-0.011	0.013	0.070	0.005	-0.160		0.057	-0.089	-0.101	-0.100	-0.023
	(0.74)	(0.13)	(0.10)	(0.53)	(0.03)	(1.18)		(0.45)	(0.89)	(0.92)	(0.77)	(0.14)
Mother's age	-0.000	0.002	0.002	0.005	0.009***	0.010***	-0.004	-0.006*	0.000	-0.003	-0.006*	-0.002
	(0.03)	(1.12)	(0.66)	(1.61)	(2.71)	(2.71)	(1.55)	(1.66)	(0.16)	(0.88)	(1.66)	(0.41)
State decriminalised marijuana						0.073*						0.049
						(1.79)						(0.99)
Family Background												
Total children (mother)	0.015*	0.001	-0.001	-0.005	-0.004	-0.012	0.017*	0.025**	0.009	-0.018	0.001	0.006
	(1.66)	(0.12)	(0.07)	(0.42)	(0.36)	(0.96)	(1.94)	(2.23)	(0.92)	(1.52)	(0.05)	(0.39)
Mother did not remarry	0.075**	0.032	0.091**	0.074*	0.156***	0.116**	0.044	0.033	0.064*	0.046	0.092*	0.096*
	(2.08)	(1.06)	(2.23)	(1.71)	(3.31)	(2.39)	(1.33)	(0.78)	(1.74)	(1.12)	(1.94)	(1.87)
Mother remarried	0.015	0.069*	0.112**	0.008	0.104*	0.145**	0.010	0.086*	0.047	0.002	0.075	0.137**
	(0.36)	(1.88)	(2.36)	(0.16)	(1.93)	(2.56)	(0.26)	(1.67)	(1.07)	(0.04)	(1.30)	(2.19)
Lived without parents	0.199***	0.048	0.188***	0.031	0.201***	0.066	0.063	0.286***	0.178***	0.015	0.266***	0.094
	(3.92)	(1.21)	(3.42)	(0.56)	(3.15)	(1.03)	(1.13)	(3.66)	(2.66)	(0.23)	(3.19)	(1.09)
Mother's highest education level:												
High school	-0.039	-0.068*	-0.091*	0.033	-0.090	-0.041	-0.066	-0.088	-0.047	0.011	-0.060	0.095
	(0.80)	(1.80)	(1.79)	(0.57)	(1.51)	(0.63)	(1.44)	(1.54)	(0.90)	(0.18)	(0.86)	(1.21)
Diploma or certificate	0.026	-0.012	0.015	0.034	-0.030	0.062	-0.003	-0.026	-0.006	-0.005	-0.016	0.057

(0.85)	(0.51)	(0.44)	(0.96)	(0.77)	(1.50)	(0.10)	(0.71)	(0.20)	(0.14)	(0.38)	(1.23)

Bachelor or higher

0.037	-0.006	0.042	-0.049	0.010	0.102*	-0.022	0.021	-0.018	-0.047	-0.018	0.049
(0.82)	(0.16)	(0.84)	(0.96)	(0.17)	(1.65)	(0.53)	(0.37)	(0.37)	(0.89)	(0.30)	(0.71)

Father's highest education level:

High school

0.038	-0.015	0.025	0.012	-0.079*	-0.063	-0.011	-0.019	0.005	0.102**	0.072	0.076
(0.98)	(0.49)	(0.58)	(0.27)	(1.66)	(1.24)	(0.36)	(0.45)	(0.12)	(2.31)	(1.46)	(1.42)

Diploma or certificate

-0.014	0.018	0.028	0.011	0.038	0.004	-0.033	0.011	-0.042	0.056	0.035	0.065
(0.43)	(0.64)	(0.77)	(0.28)	(0.89)	(0.10)	(1.08)	(0.27)	(1.19)	(1.33)	(0.74)	(1.27)

Bachelor or higher

0.016	-0.027	0.034	-0.016	0.008	0.012	-0.081**	-0.107**	-0.044	0.066	-0.002	-0.042
(0.36)	(0.74)	(0.69)	(0.32)	(0.14)	(0.20)	(2.31)	(2.09)	(1.02)	(1.15)	(0.03)	(0.64)

Mother's occupation:

SES – ANU4

-0.000	0.000	-0.000	0.001	-0.000	-0.000	0.001	-0.001	0.001	-0.000	0.001	0.002*
(0.11)	(0.12)	(0.10)	(0.68)	(0.49)	(0.45)	(0.91)	(1.27)	(0.95)	(0.09)	(1.13)	(1.64)

Occupation not reported

-0.093	-0.007	-0.024	-0.002	-0.033	-0.171	0.235**	-0.063	0.191**	0.077	0.202*	0.150
(1.22)	(0.10)	(0.28)	(0.02)	(0.31)	(1.63)	(2.51)	(0.73)	(1.97)	(0.83)	(1.83)	(1.31)

No occupation/ homemaker

-0.121*	-0.031	0.044	0.055	0.129	-0.022	0.052	-0.071	0.013	0.005	-0.127	-0.020
(1.94)	(0.54)	(0.51)	(0.58)	(1.26)	(0.21)	(0.61)	(0.82)	(0.16)	(0.05)	(1.19)	(0.16)

Father's occupation:

SES – ANU4

-0.000	0.000	-0.001	-0.001	-0.001	-0.000	0.002***	0.000	0.000	-0.002**	-0.001	-0.000
(0.40)	(0.26)	(1.25)	(1.25)	(1.59)	(0.08)	(3.25)	(0.05)	(0.58)	(2.26)	(0.65)	(0.01)

Occupation not reported

-0.009	0.064	0.092	-0.084	0.008	0.205**	0.262***	0.006	0.143*	-0.049	-0.093	0.127
(0.15)	(1.03)	(1.20)	(1.16)	(0.09)	(2.21)	(3.11)	(0.08)	(1.81)	(0.71)	(1.15)	(1.28)

No occupation/ homemaker

-0.010	-0.062	0.078	-0.037	-0.133	0.180	0.150	-0.004	-0.103	-0.022	-0.098	0.167
(0.09)	(0.77)	(0.56)	(0.27)	(0.94)	(0.98)	(1.04)	(0.03)	(1.04)	(0.16)	(0.66)	(0.74)

Parenting:

Parents read to youth at night

-0.041	-0.066***	-0.050*	-0.078**	-0.136***	-0.062*	-0.043*	-0.025	-0.040	0.019	-0.011	-0.025
(1.59)	(2.99)	(1.76)	(2.57)	(4.07)	(1.78)	(1.80)	(0.82)	(1.50)	(0.63)	(0.32)	(0.66)

Mother smoker

0.002	0.049**	0.061**	0.077***	0.124***	0.116***	0.037	0.012	0.060**	-0.025	0.148***	0.179***
(0.09)	(2.30)	(2.18)	(2.58)	(3.78)	(3.38)	(1.45)	(0.36)	(2.12)	(0.81)	(4.14)	(4.59)

Mother risky drinker

0.030	-0.049	-0.053	0.000	0.034	0.198***	0.003	0.012	0.023	0.065	0.073	0.022
(0.59)	(1.33)	(1.03)	(0.00)	(0.53)	(2.69)	(0.05)	(0.18)	(0.41)	(1.00)	(0.97)	(0.28)

Observations	921	921	921	921	921	921	743	754	754	754	754	754
Pseudo R-squared	0.068	0.085	0.072	0.055	0.093	0.085	0.096	0.102	0.090	0.071	0.087	0.069
F-test of joint significance	54.00	54.00	63.26	49.91	95.35	92.25	49.43	72.69	55.26	48.15	71.77	64.77
DF	30	30	30	30	30	31	29	30	30	30	30	31
Prob > F	0.005	0.005	0.000	0.013	0.000	0.000	0.010	0.000	0.003	0.019	0.000	0.000

F-tests of joint significance:[b]

Family structure (4)	23.745	6.331	23.081	3.933	25.042	13.468	6.788	22.688	12.280	3.922	15.763	8.400
p-value	0.000	0.176	0.000	0.415	0.000	0.009	0.148	0.000	0.015	0.417	0.003	0.078

Parental education and SES (12)	9.798	7.473	12.636	7.929	14.625	17.956	22.837	11.580	11.953	13.256	10.720	15.492
p-value	0.634	0.825	0.396	0.791	0.263	0.117	0.029	0.480	0.449	0.351	0.553	0.216
Parental education (6)	3.961	5.426	6.483	4.528	8.260	7.800	8.854	8.291	3.602	6.557	3.281	7.599
p-value	0.682	0.490	0.371	0.606	0.220	0.253	0.182	0.218	0.730	0.364	0.773	0.269
Parental SES (6)	5.504	2.304	7.022	2.569	6.456	9.742	19.518	1.894	9.033	6.710	7.210	6.569
p-value	0.481	0.890	0.319	0.861	0.374	0.136	0.003	0.929	0.172	0.348	0.302	0.363
Parental investment (3)	3.084	15.696	8.840	14.239	33.587	25.687	5.755	0.874	7.581	1.899	19.756	22.798
p-value	0.379	0.001	0.031	0.003	0.000	0.000	0.124	0.832	0.056	0.594	0.000	0.000

[a] The absolute value of z statistics are in parentheses, while significance levels are indicated as follows: * significant at 10%; ** significant at 5%; *** significant at 1%.
[b] Degrees of freedom in parenthesis.

Table 5　　Summary of IV estimation results

Model and welfare indicator used	Estimated coefficient on welfare indicator	Z-value on welfare indicator	Instrument(s) used at 1st stage	p-value on instrument(s)	Z-value on instrument(s)	F-test on instrument(s)	Rho	p-value on rho
Girls police/juvenile								
Intensive welfare use	-0.976	-3.35	Grandfather deceased[a] Grandmother deceased[a]	0.011 0.027		10.14	0.758	0.009
Any welfare use	0.674	0.92	Parent's family went on holidays out of town	0.017	-2.38	5.66	-0.301	0.522
Boys police/juvenile								
Intensive welfare use	0.409	0.59	Occupational status of grandfather[a]	0.092	-1.68	2.83	-0.089	0.831
Any welfare use	-0.402	-0.37	Parent's family went on holidays out of town	0.075	-1.78	3.16	0.330	0.695
Boys bad crowd								
Intensive welfare use	1.283	2.64	Occupational status of grandfather[a]	0.138	-1.48	2.20	-0.578	0.198
Any welfare use	Did not converge		Parent's family went on holidays out of town					
Boys drinking								
Intensive welfare use	0.715	1.14	Occupational status of grandfather[a]	0.093	-1.68	2.81	-0.253	0.522
Any welfare use	-0.442	-0.49	Parent's family went on holidays out of town	0.055	-1.92	3.69	0.337	0.547
Boys smoking								
Intensive welfare use	-0.798	-0.99	Occupational status of grandfather[a]	0.087	-1.71	2.93	0.592	0.285
Any welfare use	-1.213	-2.93	Parent's family went on holidays out of town	0.112	-1.59	2.53	0.808	0.249

[a] Data used refer to mother's parents when she was 14 years of age.

Table 6　　　Sensitivity analysis: coefficient on welfare use in univariate probit and constrained bivariate probit

Model (outcome, gender)	Welfare use	$\rho = 0$	$\rho = 0.1$	$\rho = 0.2$	$\rho = 0.3$	$\rho = 0.4$	$\rho = 0.5$
Girls police/juvenile	Any welfare receipt	0.212 (0.144)	0.044 (0.144)	-0.127 (0.143)	-0.301[**] (0.141)	-0.480[***] (0.138)	-0.664[***] (0.133)
	Intensive welfare receipt	0.304[**] (0.134)	0.133 (0.133)	-0.038 (0.132)	-0.208 (0.129)	-0.378[***] (0.126)	-0.549[***] (0.122)
Boys police/juvenile	Any welfare receipt	0.168 (0.136)	0.003 (0.135)	-0.164 (0.134)	-0.333[**] (0.132)	-0.504[***] (0.129)	-0.678[***] (0.125)
	Intensive welfare receipt	0.259[**] (0.131)	0.090 (0.130)	-0.079 (0.129)	-0.248[**] (0.127)	-0.417[***] (0.123)	-0.586[***] (0.119)
Boys bad crowd	Any welfare receipt	0.213 (0.149)	0.049 (0.149)	-0.118 (0.148)	-0.286[**] (0.146)	-0.456[***] (0.143)	-0.630[***] (0.139)
	Intensive welfare receipt	0.317[**] (0.141)	0.148 (0.140)	-0.021 (0.139)	-0.191 (0.136)	-0.361[***] (0.133)	-0.532[***] (0.128)
Boys drinking	Any welfare receipt	0.118 (0.135)	-0.047 (0.134)	-0.213 (0.133)	-0.381[***] (0.131)	-0.550[***] (0.128)	-0.721[***] (0.124)
	Intensive welfare receipt	0.289[**] (0.135)	0.119 (0.134)	-0.052 (0.133)	-0.223[*] (0.130)	-0.394[***] (0.127)	-0.565[***] (0.123)
Boys smoking	Any welfare receipt	0.149 (0.126)	-0.017 (0.126)	-0.183 (0.125)	-0.351[***] (0.123)	-0.520[***] (0.120)	-0.690[***] (0.116)
	Intensive welfare receipt	0.189 (0.126)	0.020 (0.126)	-0.149 (0.124)	-0.618[***] (0.122)	-0.485[***] (0.119)	-0.652[***] (0.115)

Standard errors in parenthesis; [*] significant at 10%, [**] significant at 5%, [***] significant at 1%.

Table 7   **The amount of selection of unobservables relative to selection on observables required to attribute the entire welfare effect to selection bias**

Model (gender, outcome)	Welfare use	Univariate probit estimate	Implied bias	Ratio of estimate to bias
Girls police/juvenile	Any welfare receipt	0.212 (0.144)	1.968	0.107
	Intensive welfare receipt	0.304* (0.134)	2.400	0.127
Boys police/juvenile	Any welfare receipt	0.168 (0.136)	1.860	0.090
	Intensive welfare receipt	0.259** (0.131)	2.172	0.119
Boys bad crowd	Any welfare receipt	0.213 (0.149)	2.020	0.106
	Intensive welfare receipt	0.317** (0.141)	1.878	0.169
Boys drinking	Any welfare receipt	0.118 (0.135)	0.972	0.121
	Intensive welfare receipt	0.289** (0.135)	0.784	0.369
Boys smoking	Any welfare receipt	0.149 (0.126)	2.173	0.069
	Intensive welfare receipt	0.189 (0.126)	1.698	0.111

Standard errors in parenthesis; *significant at 10%, ** significant at 5%, *** significant at 1%.

Appendix table 1 Summary statistics for independent variables[a]

Variable	All respondents		Girls		Boys	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Intensive welfare[b]	0.280	0.45	0.281	0.45	0.279	0.45
Moderate late welfare[b]	0.127	0.33	0.126	0.33	0.127	0.33
Moderate early welfare[b]	0.265	0.44	0.263	0.44	0.268	0.44
Basic youth demographics:						
Indigenous	0.027	0.16	0.028	0.16	0.026	0.16
Migrant from non-English speaking country	0.032	0.18	0.032	0.18	0.032	0.18
Migrant from English-speaking country	0.026	0.16	0.026	0.16	0.025	0.16
Lives in major city	0.598	0.49	0.604	0.49	0.590	0.49
Either parent is a migrant from non-English speaking country	0.186	0.39	0.188	0.39	0.183	0.39
Either parent is a migrant from English-speaking country	0.182	0.39	0.175	0.38	0.191	0.39
Mother indigenous	0.016	0.13	0.018	0.13	0.014	0.12
Mother's age	29.803	4.80	29.894	4.82	29.687	4.76
State decriminalized marijuana	0.197	0.40	0.217	0.41	0.171	0.38
Family Background:						
Total children (mother)	3.016	1.29	2.987	1.28	3.050	1.29
Mother did not remarry	0.180	0.38	0.176	0.38	0.185	0.39
Mother remarried	0.121	0.33	0.120	0.32	0.123	0.33
Lived without parents	0.062	0.24	0.074	0.26	0.048	0.21
Parental SES: *mother's highest education level:*						
High school	0.081	0.27	0.082	0.27	0.080	0.27
Diploma or certificate	0.435	0.50	0.418	0.49	0.454	0.50
Bachelor or higher	0.198	0.40	0.191	0.39	0.206	0.41
Parental SES: *father's highest education level:*						
High school	0.151	0.36	0.137	0.34	0.169	0.38
Diploma or certificate	0.245	0.43	0.261	0.44	0.225	0.42
Bachelor or higher	0.187	0.39	0.195	0.40	0.177	0.38
Parental SES: *mother's occupation:*						
SES – ANU4	45.422	25.87	44.957	25.57	45.996	26.23
Occupation not reported	0.030	0.17	0.027	0.16	0.032	0.18
No occupation/ homemaker	0.031	0.17	0.034	0.18	0.027	0.16
Parental SES: *father's occupation:*						
SES – ANU4	44.048	25.08	44.054	25.14	44.016	25.04
Occupation not reported	0.046	0.21	0.047	0.21	0.046	0.21
No occupation/ homemaker	0.009	0.10	0.009	0.10	0.009	0.10
Parenting:						
Parents read to youth at night	0.535	0.50	0.605	0.49	0.450	0.50
Mother smoker	0.445	0.50	0.447	0.50	0.441	0.50
Mother risky drinker	0.057	0.23	0.057	0.23	0.055	0.23
No of obs	*1,675*		*921*		*754*	

[a] Means and standard deviations are weighted according to the population (administrative dataset) weights except where indicated.

[b] Unweighted means and standard deviations.