

Supplementary Materials

Table S1. Proportion of sample reporting hobby engagement at each wave.

Hobby engagement in the past week	Wave 1	Wave 2	Wave 3
	Proportion		
Overall			
None	19%	15%	22%
1-2 times	32%	34%	29%
3-4 times	23%	24%	26%
5+ times	26%	27%	23%
Early adolescents			
None	16%	12%	21%
1-2 times	32%	31%	28%
3-4 times	24%	27%	25%
5+ times	28%	30%	26%
Mid adolescents			
None	20%	16%	21%
1-2 times	33%	35%	30%
3-4 times	22%	23%	27%
5+ times	25%	26%	22%
Late adolescents			
None	24%	21%	24%
1-2 times	33%	38%	28%
3-4 times	21%	21%	28%
5+ times	22%	20%	20%

Note. N=7,454. Descriptive statistics account for survey design characteristics and weighted.

Table S2. Proportion of sample reporting substance use at each wave.

Age group	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
	Proportion				
Binge drinking					
Overall	23%	28%	54%	53%	47%
Early	11%	18%	53%	57%	49%
Mid	28%	32%	54%	51%	46%
Late	39%	42%	54%	48%	45%
Marijuana use					
Overall	12%	15%	25%	18%	19%
Early	7%	13%	28%	20%	22%
Mid	15%	17%	23%	16%	18%
Late	18%	18%	21%	16%	17%
Tobacco use					
Overall	27%	37%	38%	41%	31%
Early	19%	31%	39%	43%	33%
Mid	31%	39%	38%	40%	30%
Late	38%	44%	37%	39%	30%

Note. N=7,454. Descriptive statistics account for survey design characteristics and weighted. Participants with complete data varied at Wave 4 (overall drinking n=6,561; marijuana n=6,578; tobacco n=6,583) and Wave 5 (overall drinking n=5,265; marijuana n=5,270; tobacco n=5,269).

Table S3. Overview of linear growth models estimated.

Model	Substance use slope	Hobby and substance use relationship	No. parameters
1	W1-5 linear	W1-3 fixed	42
2	W1-2 linear W3-5 free	W1-3 fixed	45
3	W1-5 linear	W1-3 free	48
4	W1-2 linear W3-5 free	W1-2 fixed W3 free	48
5	W1-2 linear W3-5 free	W1 free W2-3 fixed	48
6	W1-2 linear W3-5 free	W1-3 free	51

Note. Bold text indicates winning models.

Table S4. Model fit statistics for all linear growth models estimated.

Model	AIC	BIC	Sample-size adjusted BIC
Binge drinking			
1	40,212	40,502	40,369
2	37,718	38,029	37,886
3	38,593	38,925	38,772
4	37,657	37,989	37,836
5	37,680	38,012	37,859
6	37,628	37,981	37,819
Marijuana use			
1	28,180	28,470	28,337
2	27,354	27,666	27,523
3	27,460	27,792	27,639
4	27,304	27,636	27,483
5	27,275	27,607	27,454
6	27,223	27,575	27,413
Tobacco use			
1	35,920	36,211	36,077
2	35,512	35,823	35,680
3	35,345	35,677	35,525
4	35,507	35,839	35,686
5	35,198	35,530	35,377
6	35,186	35,539	35,377

Note. Bold text indicates lowest values and winning models for each outcome.

Table S5. Chi-square difference tests comparing model fit for the whole sample.

Model comparison	Binge drinking	Marijuana use	Tobacco use
2 vs 1	$\chi^2(3) = 1208, p < .001$	$\chi^2(3) = 381, p < .001$	$\chi^2(3) = 107, p < .001$
3 vs 1	$\chi^2(6) = 939, p < .001$	$\chi^2(6) = 440, p < .001$	$\chi^2(6) = 366, p < .001$
4 vs 2	$\chi^2(3) = 38, p < .001$	$\chi^2(3) = 38, p < .001$	$\chi^2(3) = 3.26, p = .353$
5 vs 2	$\chi^2(3) = 33, p < .001$	$\chi^2(3) = 58, p < .001$	$\chi^2(3) = 291, p < .001$
6 vs 2	$\chi^2(6) = 64, p < .001$	$\chi^2(6) = 78, p < .001$	$\chi^2(6) = 166, p < .001$
6 vs 3	$\chi^2(3) = 541, p < .001$	$\chi^2(3) = 95, p < .001$	$\chi^2(3) = 35, p < .001$
6 vs 4	$\chi^2(3) = 25, p < .001$	$\chi^2(3) = 39, p < .001$	$\chi^2(3) = 435, p < .001$
6 vs 5	$\chi^2(3) = 31, p < .001$	$\chi^2(3) = 26, p < .001$	$\chi^2(3) = 5.90, p = .116$

Note. Bold text indicates winning model.

Table S6. Concurrent associations between hobby engagement frequency in the last week (none, 1-2 times, 3-4 times, 5+ times) and substance use at each wave from the latent growth models, estimated separately by age group and adjusted for all covariates.

	Early adolescents (n=2,562)	Mid adolescents (n=3,176)	Late adolescents (n=1,716)
	Odds ratio (95% confidence interval)		
Binge drinking			
Wave 1			
1-2 times	0.47 (0.21, 0.73)	0.81 (0.42, 1.21)	0.89 (0.47, 1.31)
3-4 times	0.32 (0.12, 0.52)	0.45 (0.23, 0.68)	0.66 (0.26, 1.07)
5+ times	0.29 (0.12, 0.46)	0.30 (0.14, 0.47)	0.32 (0.14, 0.51)
Wave 2			
1-2 times	1.04 (0.58, 1.50)	0.91 (0.58, 1.25)	0.95 (0.56, 1.35)
3-4 times	0.81 (0.43, 1.20)	0.63 (0.35, 0.92)	1.04 (0.46, 1.62)
5+ times	0.60 (0.28, 0.91)	0.58 (0.33, 0.83)	0.51 (0.22, 0.80)
Wave 3			
1-2 times	1.41 (0.97, 1.85)	1.56 (1.10, 2.01)	1.80 (1.32, 2.29)
3-4 times	1.34 (0.84, 1.83)	1.79 (1.30, 2.29)	1.87 (1.26, 2.47)
5+ times	0.98 (0.62, 1.35)	1.82 (1.16, 2.49)	2.14 (1.38, 2.91)
Marijuana use			
Wave 1			
1-2 times	0.33 (0.13, 0.52)	0.71 (0.32, 1.10)	0.78 (0.37, 1.18)
3-4 times	0.23 (0.07, 0.39)	0.50 (0.23, 0.76)	0.43 (0.19, 0.68)
5+ times	0.28 (0.10, 0.46)	0.35 (0.17, 0.53)	0.61 (0.18, 1.04)
Wave 2			
1-2 times	1.35 (0.52, 2.17)	1.10 (0.61, 1.60)	0.98 (0.52, 1.45)
3-4 times	0.74 (0.28, 1.19)	1.06 (0.48, 1.63)	1.58 (0.73, 2.44)
5+ times	0.89 (0.30, 1.48)	0.54 (0.25, 0.83)	0.82 (0.31, 1.34)
Wave 3			
1-2 times	1.50 (1.04, 1.95)	2.21 (1.55, 2.87)	1.25 (0.68, 1.83)
3-4 times	1.59 (1.06, 2.12)	2.06 (1.22, 2.90)	2.10 (1.14, 3.06)
5+ times	1.40 (0.88, 1.93)	2.76 (1.39, 4.12)	2.98 (1.47, 4.49)
Tobacco use			
Wave 1			
1-2 times	0.52 (0.36, 0.68)	0.30 (0.16, 0.44)	0.55 (0.30, 0.79)
3-4 times	0.57 (0.36, 0.79)	0.27 (0.16, 0.37)	0.30 (0.15, 0.44)
5+ times	0.33 (0.18, 0.47)	0.28 (0.15, 0.41)	0.31 (0.14, 0.48)
Wave 2			
1-2 times	1.49 (1.09, 1.88)	1.02 (0.66, 1.38)	1.00 (0.64, 1.35)
3-4 times	1.54 (1.12, 1.95)	0.78 (0.48, 1.07)	0.92 (0.64, 1.20)
5+ times	1.27 (0.93, 1.60)	0.83 (0.55, 1.11)	0.91 (0.60, 1.22)
Wave 3			
1-2 times	1.49 (1.09, 1.88)	1.02 (0.66, 1.38)	1.00 (0.64, 1.35)
3-4 times	1.54 (1.12, 1.95)	0.78 (0.48, 1.07)	0.92 (0.64, 1.20)
5+ times	1.27 (0.93, 1.60)	0.83 (0.55, 1.11)	0.91 (0.60, 1.22)

Note. The reference group in all models was no engagement. Bold text indicates 95% confidence intervals do not include 1 ($p < 0.05$). Early adolescents had a mean age of 13.39 at Wave 1, 14.27 at Wave 2, and 19.74 at Wave 3. Mid adolescents had a mean age of 15.48 at Wave 1, 16.35 at Wave 2, and 21.81 at Wave 3. Late adolescents had a mean age of 17.30 at Wave 1, 18.14 at Wave 2, and 23.55 at Wave 3.

Table S7. Sensitivity analysis: Concurrent associations between hobby engagement frequency in the last week (none, 1-2 times, 3-4 times, 5+ times) and substance use at each wave from the latent growth models, adjusted for all covariates and estimated separately by age group and gender.

	Early adolescents		Mid adolescents		Late adolescents	
	Males (n=1,133)	Females (n=1,429)	Males (n=1,494)	Females (n=1,682)	Males (n=900)	Females (n=816)
	Odds ratio (95% confidence interval)					
Binge drinking						
Wave 1						
1-2 times	0.50 (0.20, 1.28)	0.47 (0.22, 1.00)	0.80 (0.37, 1.69)	0.84 (0.45, 1.57)	0.73 (0.36, 1.46)	0.60 (0.25, 1.44)
3-4 times	0.26 (0.10, 0.69)	0.39 (0.16, 0.96)	0.40 (0.17, 0.97)	0.48 (0.24, 0.95)	0.52 (0.28, 0.96)	0.87 (0.25, 3.08)
5+ times	0.39 (0.15, 1.00)	0.18 (0.08, 0.39)	0.54 (0.24, 1.21)	0.13 (0.06, 0.28)	0.36 (0.19, 0.67)	0.27 (0.09, 0.83)
Wave 2						
1-2 times	0.95 (0.40, 2.26)	1.12 (0.64, 1.94)	1.01 (0.63, 1.62)	0.82 (0.51, 1.31)	0.84 (0.44, 1.61)	0.94 (0.41, 2.14)
3-4 times	0.83 (0.38, 1.82)	0.82 (0.47, 1.44)	0.75 (0.38, 1.48)	0.54 (0.32, 0.92)	1.17 (0.63, 2.20)	0.65 (0.25, 1.69)
5+ times	0.53 (0.25, 1.12)	0.74 (0.36, 1.48)	0.54 (0.32, 0.91)	0.64 (0.35, 1.18)	0.49 (0.26, 0.92)	0.66 (0.21, 2.06)
Wave 3						
1-2 times	1.43 (0.86, 2.39)	1.41 (0.98, 2.05)	2.50 (1.51, 4.15)	1.23 (0.90, 1.68)	2.15 (1.22, 3.77)	1.70 (1.03, 2.82)
3-4 times	1.20 (0.65, 2.22)	1.48 (1.02, 2.14)	1.98 (1.25, 3.13)	1.71 (1.17, 2.50)	2.20 (1.22, 3.97)	1.13 (0.72, 1.77)
5+ times	1.09 (0.66, 1.82)	0.86 (0.51, 1.44)	1.79 (1.09, 2.93)	2.14 (1.25, 3.66)	2.93 (1.62, 5.27)	1.15 (0.63, 2.11)
Marijuana use						
Wave 1						
1-2 times	0.36 (0.14, 0.93)	0.33 (0.14, 0.75)	1.21 (0.49, 2.95)	0.54 (0.27, 1.08)	0.59 (0.27, 1.32)	0.62 (0.19, 2.09)
3-4 times	0.27 (0.11, 0.64)	0.27 (0.10, 0.76)	0.56 (0.20, 1.59)	0.50 (0.28, 0.90)	0.35 (0.13, 0.91)	0.46 (0.12, 1.77)
5+ times	0.35 (0.14, 0.90)	0.28 (0.10, 0.76)	0.60 (0.27, 1.33)	0.24 (0.11, 0.52)	0.88 (0.25, 3.07)	0.43 (0.08, 2.28)
Wave 2						
1-2 times	1.37 (0.57, 3.30)	1.49 (0.66, 3.39)	1.70 (0.86, 3.39)	0.68 (0.39, 1.19)	0.86 (0.42, 1.73)	0.58 (0.20, 1.67)
3-4 times	0.88 (0.35, 2.20)	0.71 (0.30, 1.64)	2.20 (1.05, 4.62)	0.46 (0.24, 0.89)	1.27 (0.51, 3.18)	1.45 (0.37, 5.63)
5+ times	1.13 (0.49, 2.59)	0.83 (0.35, 1.93)	0.69 (0.34, 1.41)	0.41 (0.20, 0.83)	0.69 (0.27, 1.75)	0.60 (0.11, 3.38)
Wave 3						
1-2 times	1.00 (0.47, 2.13)	1.94 (1.29, 2.92)	1.74 (0.97, 3.12)	2.16 (1.50, 3.10)	1.26 (0.62, 2.57)	1.64 (0.66, 4.09)
3-4 times	1.28 (0.58, 2.84)	1.70 (1.04, 2.77)	1.37 (0.72, 2.60)	2.38 (1.33, 4.25)	3.53 (2.06, 6.02)	0.99 (0.36, 2.73)
5+ times	1.29 (0.62, 2.73)	1.26 (0.71, 2.23)	2.54 (1.39, 4.64)	2.37 (1.12, 5.00)	3.45 (1.66, 7.16)	3.09 (0.97, 9.83)
Tobacco use						
Wave 1						
1-2 times	0.43 (0.23, 0.80)	0.62 (0.43, 0.90)	0.46 (0.25, 0.87)	0.21 (0.13, 0.34)	0.52 (0.22, 1.21)	0.31 (0.15, 0.66)
3-4 times	0.36 (0.21, 0.64)	0.95 (0.55, 1.65)	0.43 (0.22, 0.84)	0.16 (0.10, 0.26)	0.62 (0.29, 1.35)	0.10 (0.04, 0.24)
5+ times	0.34 (0.19, 0.60)	0.31 (0.18, 0.54)	0.42 (0.22, 0.80)	0.18 (0.11, 0.31)	0.23 (0.11, 0.49)	0.57 (0.21, 1.58)
Wave 2						
1-2 times	1.08 (0.69, 1.70)	2.04 (1.39, 2.99)	0.97 (0.66, 1.45)	1.00 (0.70, 1.41)	0.84 (0.52, 1.36)	1.31 (0.66, 2.59)
3-4 times	1.22 (0.74, 2.00)	1.88 (1.29, 2.75)	0.92 (0.65, 1.32)	0.56 (0.34, 0.92)	1.01 (0.63, 1.63)	0.94 (0.46, 1.90)
5+ times	0.93 (0.61, 1.42)	1.83 (1.26, 2.68)	1.00 (0.69, 1.44)	0.60 (0.39, 0.93)	0.79 (0.48, 1.30)	1.26 (0.58, 2.70)
Wave 3						
1-2 times	1.08 (0.69, 1.70)	2.04 (1.39, 2.99)	0.97 (0.66, 1.45)	1.00 (0.70, 1.41)	0.84 (0.52, 1.36)	1.31 (0.66, 2.59)
3-4 times	1.22 (0.74, 2.00)	1.88 (1.29, 2.75)	0.92 (0.65, 1.32)	0.56 (0.34, 0.92)	1.01 (0.63, 1.63)	0.94 (0.46, 1.90)
5+ times	0.93 (0.61, 1.42)	1.83 (1.26, 2.68)	1.00 (0.69, 1.44)	0.60 (0.39, 0.93)	0.79 (0.48, 1.30)	1.26 (0.58, 2.70)

Note. The reference group in all models was no engagement. Bold text indicates 95% confidence intervals do not include 1 ($p < 0.05$). Early adolescents had a mean age of 13.39 at Wave 1, 14.27 at Wave 2, and 19.74 at Wave 3. Mid adolescents had a mean age of 15.48 at Wave 1, 16.35 at Wave 2, and 21.81 at Wave 3. Late adolescents had a mean age of 17.30 at Wave 1, 18.14 at Wave 2, and 23.55 at Wave 3.

Table S8. Sensitivity analysis: Evaluating the implications of altering the sample eligibility criteria and approach to missing data on the concurrent associations between hobby engagement frequency and binge drinking at each wave from the latent growth models, adjusted for all covariates, estimated just for early adolescents.

	Original (n=2,562)	Sensitivity 1 (n=4,961)	Sensitivity 2 (n=3,471)	Sensitivity 3 (n=2,413)
	Odds ratio (95% confidence interval)			
Early adolescents: Binge drinking				
Wave 1				
1-2 times	0.47 (0.21, 0.73)	0.46 (0.31, 0.69)	0.44 (0.29, 0.66)	0.44 (0.19, 1.03)
3-4 times	0.32 (0.12, 0.52)	0.36 (0.23, 0.56)	0.33 (0.21, 0.53)	0.43 (0.11, 1.74)
5+ times	0.29 (0.12, 0.46)	0.33 (0.23, 0.47)	0.30 (0.19, 0.46)	0.30 (0.13, 0.68)
Wave 2				
1-2 times	1.04 (0.58, 1.50)	0.98 (0.66, 1.46)	1.01 (0.69, 1.47)	1.14 (0.29, 4.44)
3-4 times	0.81 (0.43, 1.20)	0.77 (0.52, 1.13)	0.76 (0.51, 1.15)	0.90 (0.13, 6.17)
5+ times	0.60 (0.28, 0.91)	0.69 (0.45, 1.04)	0.66 (0.41, 1.06)	0.81 (0.12, 5.37)
Wave 3				
1-2 times	1.41 (0.97, 1.85)	1.38 (1.09, 1.76)	1.37 (1.06, 1.77)	1.38 (1.03, 1.85)
3-4 times	1.34 (0.84, 1.83)	1.38 (0.99, 1.91)	1.35 (0.96, 1.91)	1.44 (0.87, 2.38)
5+ times	0.98 (0.62, 1.35)	0.99 (0.72, 1.37)	0.98 (0.71, 1.35)	1.25 (0.71, 2.20)

Note. Original: Sample restricted to participants with no missing data on any study variables at waves 1-3, but missing data on substance use at waves 4-5 handled using FIML. Early adolescent group only (n=2,562).

Sensitivity 1: Sample included all participants who participated in at least one wave and reported their age at baseline, with all missing data handled using FIML. Early adolescent group only (n=4,961).

Sensitivity 2: Sample restricted to participants who participated at waves 1-3 with complete baseline age data, with all missing data handled using FIML. Early adolescent group only (n=3,471).

Sensitivity 3: Sample restricted to participants who participated at waves 1-5 with complete baseline age data, with all missing data handled using FIML. Early adolescent group only (n=2,413).

Mplus Model Syntax

Final model: Binge drinking

Data:

```
File = ah_subuse.dat ;
```

Variable:

```
Names =  
  aid psuscid region gswgt3 insamp w1hobby1 w1hobby2 w1hobby3 w1hobby4  
  w2hobby1 w2hobby2 w2hobby3 w2hobby4 w3hobby1 w3hobby2 w3hobby3 w3hobby4  
  age gender grade hinc lang psmoke palc race1 race2 race3 race4  
  pedu1 pedu2 pedu3 pedu4 pmarit1 pmarit2 pmarit3 urban1 urban2 urban3  
  w1drink w2drink w3drink w4drink w5drink w1mar w2mar w3mar w4mar w5mar  
  w1tob w2tob w3tob w4tob w5tob ;
```

Missing =

```
all (-999) ;
```

Usevar =

```
w1drink w2drink w3drink w4drink w5drink  
w1hobby2 w1hobby3 w1hobby4 w2hobby2  
w2hobby3 w2hobby4 w3hobby2 w3hobby3 w3hobby4  
age gender grade hinc lang psmoke palc race2 race3 race4  
pedu1 pedu2 pedu3 pmarit2 pmarit3 urban2 urban3  
gswgt3 psuscid region ;
```

Categorical =

```
w1drink w2drink w3drink w4drink w5drink ;
```

Weight =

```
gswgt3 ;
```

Cluster =

```
psuscid ;
```

Strat =

```
region ;
```

Subpopulation =

```
insamp == 1 ;
```

Analysis:

```
Estimator = MLR ;
```

```
Type = complex ;
```

Model:

```
i sl |      w1drink@0 w2drink@1 w3drink* w4drink* w5drink* ;  
  
i sl ON     age gender grade hinc lang psmoke palc  
            race2 race3 race4 pedu1 pedu2 pedu3 pmarit2 pmarit3 urban2 urban3 ;  
  
w1drink ON  w1hobby2 w1hobby3 w1hobby4 ;  
  
w2drink ON  w2hobby2 w2hobby3 w2hobby4 ;  
  
w3drink ON  w3hobby2 w3hobby3 w3hobby4 ;
```

Output:

```
TECH1 ;  
TECH4 ;  
TECH8 ;  
RESIDUAL ;
```

Final model: Marijuana use

Data:

```
File = ah_subuse.dat ;
```

Variable:

Names =

```
aid psuscid region gswgt3 insamp w1hobby1 w1hobby2 w1hobby3 w1hobby4  
w2hobby1 w2hobby2 w2hobby3 w2hobby4 w3hobby1 w3hobby2 w3hobby3 w3hobby4  
age gender grade hinc lang psmoke palc race1 race2 race3 race4  
pedu1 pedu2 pedu3 pedu4 pmarit1 pmarit2 pmarit3 urban1 urban2 urban3  
wldrink w2drink w3drink w4drink w5drink w1mar w2mar w3mar w4mar w5mar  
wltob w2tob w3tob w4tob w5tob ;
```

Missing =

```
all (-999) ;
```

Usevar =

```
w1mar w2mar w3mar w4mar w5mar  
w1hobby2 w1hobby3 w1hobby4 w2hobby2  
w2hobby3 w2hobby4 w3hobby2 w3hobby3 w3hobby4  
age gender grade hinc lang psmoke palc race2 race3 race4  
pedu1 pedu2 pedu3 pmarit2 pmarit3 urban2 urban3  
gswgt3 psuscid region ;
```

Categorical =

```
w1mar w2mar w3mar w4mar w5mar ;
```

Weight =

```
gswgt3 ;
```

Cluster =

```
psuscid ;
```

Strat =

```
region ;
```

Subpopulation =

```
insamp == 1 ;
```

Analysis:

```
Estimator = MLR ;
```

```
Type = complex ;
```

Model:

```
i sl | w1mar@0 w2mar@1 w3mar* w4mar* w5mar* ;
```

```
i sl ON age gender grade hinc lang psmoke palc  
race2 race3 race4 pedu1 pedu2 pedu3 pmarit2 pmarit3 urban2 urban3 ;
```

```
w1mar ON w1hobby2 w1hobby3 w1hobby4 ;
```

```
w2mar ON w2hobby2 w2hobby3 w2hobby4 ;
```

```
w3mar ON w3hobby2 w3hobby3 w3hobby4 ;
```

Output:

```
TECH1 ;
```

```
TECH4 ;
```

```
TECH8 ;
```

```
RESIDUAL ;
```

Final model: Tobacco use

Data:

```
File = ah_subuse.dat ;
```

Variable:

```
Names =
```

```
aid psuscid region gswgt3 insamp w1hobby1 w1hobby2 w1hobby3 w1hobby4  
w2hobby1 w2hobby2 w2hobby3 w2hobby4 w3hobby1 w3hobby2 w3hobby3 w3hobby4  
age gender grade hinc lang psmoke palc race1 race2 race3 race4  
pedu1 pedu2 pedu3 pedu4 pmarit1 pmarit2 pmarit3 urban1 urban2 urban3  
wldrink w2drink w3drink w4drink w5drink w1mar w2mar w3mar w4mar w5mar  
wltob w2tob w3tob w4tob w5tob ;
```

```
Missing =
```

```
all (-999) ;
```

```
Usevar =
```

```
wltob w2tob w3tob w4tob w5tob  
w1hobby2 w1hobby3 w1hobby4 w2hobby2  
w2hobby3 w2hobby4 w3hobby2 w3hobby3 w3hobby4  
age gender grade hinc lang psmoke palc race2 race3 race4  
pedu1 pedu2 pedu3 pmarit2 pmarit3 urban2 urban3  
gswgt3 psuscid region ;
```

```
Categorical =
```

```
wltob w2tob w3tob w4tob w5tob ;
```

```
Weight =
```

```
gswgt3 ;
```

```
Cluster =
```

```
psuscid ;
```

```
Strat =
```

```
region ;
```

```
Subpopulation =
```

```
insamp == 1 ;
```

Analysis:

```
Estimator = MLR ;
```

```
Type = complex ;
```

Model:

```
i sl | wltob@0 w2tob@1 w3tob* w4tob* w5tob* ;
```

```
i sl ON age gender grade hinc lang psmoke palc  
race2 race3 race4 pedu1 pedu2 pedu3 pmarit2 pmarit3 urban2 urban3 ;
```

```
w1mar ON w1hobby2 w1hobby3 w1hobby4 ;
```

```
w2mar ON w2hobby2 w2hobby3 w2hobby4 ;
```

```
w3mar ON w3hobby2 w3hobby3 w3hobby4 ;
```

Output:

```
TECH1 ;
```

```
TECH4 ;
```

```
TECH8 ;
```

```
RESIDUAL ;
```