HEALTH ECONOMICS
Health Econ. **24**: 1644–1650 (2015)
Published online 7 October 2014 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/hec.3116

HEALTH ECONOMICS LETTER

THE METH PROJECT AND TEEN METH USE: NEW ESTIMATES FROM THE NATIONAL AND STATE YOUTH RISK BEHAVIOR SURVEYS

D. MARK ANDERSON[a,*] and DAVID ELSEA[b]

[a]*Department of Agricultural Economics and Economics, Montana State University, Bozeman, MT, USA*
[b]*Department of Agricultural and Applied Economics, University of Wisconsin, Madison, WI, USA*

ABSTRACT

In this note, we use data from the national and state Youth Risk Behavior Surveys for the period 1999 through 2011 to estimate the relationship between the Meth Project, an anti-methamphetamine advertising campaign, and meth use among high school students. During this period, a total of eight states adopted anti-meth advertising campaigns. After accounting for pre-existing downward trends in meth use, we find little evidence that the campaign curbed meth use in the full sample. We do find, however, some evidence that the Meth Project may have decreased meth use among White high school students. Copyright © 2014 John Wiley & Sons, Ltd.

Received 29 August 2013; Revised 23 May 2014; Accepted 16 September 2014

JEL Classification: H75, I18, K42, M37

KEY WORDS: meth project; methamphetamine use; youth risky behavior; anti-drug campaign

"We brought the Meth Project to Georgia to stem the growing methamphetamine epidemic in our state, and we are seeing impressive results."

—Johnny Isakson, Republican Senator of Georgia

1. INTRODUCTION

In 2005, Montana adopted an anti-methamphetamine advertising campaign known as the Meth Project. The goal of this campaign is to reduce methamphetamine (meth) use by increasing the perceived risk and decreasing the perceived benefit of trying meth, promoting dialogue about meth between parents and teens, and stigmatizing use (Siebel and Mange, 2009). The campaign relies primarily on graphic print impressions, radio and television ads, and highway billboards. The ads consist of disturbing images such as addicts tearing off their own skin, young girls selling their bodies to older men for meth, and meth-crazed teens beating their parents for money.[1]

Because of the apparent success of Montana's campaign, seven additional states have adopted their own Meth Projects (refer to Table I).[2] In 2010, *Barron's* magazine listed the Meth Project as the third most effective philanthropy in the world (Scholars, 2010). However, after accounting for pre-existing downward trends in

*Correspondence to: Department of Agricultural Economics and Economics, Montana State University, Bozeman, MT 59717-2920, USA.
E-mail: dwight.anderson@montana.edu

[1]To view the Meth Project ads, visit http://montana.methproject.org/Our-Work/view-ads.php.
[2]The editorial board of the Star-Tribune, a major newspaper in Wyoming, was quoted as saying, "…the fact that Wyoming and six other states have launched programs similar to the Montana Meth Project shows plenty of people see it as something worth emulating (Star-Tribune Editorial Board 2010)."

Table I. Meth Projects, 1999–2011

	Effective Date
Arizona	April 2007
Colorado	May 2009
Georgia	March 2010
Hawaii	June 2009
Idaho	January 2008
Illinois	February 2008
Montana	September 2005
Wyoming	June 2008

meth use, Anderson (2010) found little evidence of a relationship between the Montana Meth Project and meth use among high school students.[3]

Because of the focus on Montana, it is unclear whether the results from Anderson (2010) generalize. In an effort to examine whether the Meth Project was more successful elsewhere, we extend the Anderson (2010) analysis through 2011. Similar to Anderson (2010), after accounting for pre-existing downward trends in meth use, we find little evidence of a relationship between the Meth Project and meth use in the full sample. We do find, however, some evidence that the Meth Project may have decreased meth use among white high school students.

2. DATA AND EMPIRICAL MODEL

The data for this study come from the national and state Youth Risk Behavior Survey (YRBS) and cover the period 1999 through 2011.[4] The national YRBS is conducted biennially by the Centers for Disease Control and Prevention (CDC) and is representative of the population of US high school students.[5] The state surveys are also school-based and mirror the national surveys in terms of content. Although the state surveys are coordinated by the CDC, they are typically administered by state education and health agencies.

Our analysis uses both of these data sources so that identification comes from as many Meth Project adoptions as possible. While intended to be nationally representative, not all 50 states contribute data to the national YRBS in any given year.[6] Between 1999 and 2011, 11 states contributed data to the national YRBS every year and six states contributed data before and after the adoption of their Meth Project (Arizona, Colorado, Georgia, Hawaii, Idaho, and Illinois). Table AI (available online) illustrates the number of observations by year and state in the national YRBS analysis.

Most states conducted their own version of the YRBS at some point between 1999 and 2011. We have obtained data from 45 states, seven of which conducted surveys before and after the adoption of their Meth Project (Arizona, Colorado, Georgia, Idaho, Illinois, Montana, and Wyoming).[7] Table AII (available online) illustrates the number of observations each state contributed to the state YRBS analysis. In combination, the national and state YRBS data cover all states and the District of Columbia. All eight states with Meth Projects

[3]Refer to Anderson (2010) for a detailed description of the Montana Meth Project. Refer to Dobkin and Nicosia (2009) and Cunningham and Finlay (2013) for research on supply-side meth shocks.

[4]Anderson (2010) used national YRBS data through 2007 and Montana YRBS data through 2009. It is not possible to observe meth use prior to 1999 because this was the first year the YRBS asked respondents about meth use.

[5]Federal agencies use the national YRBS data to follow trends in adolescent behaviors such as eating and exercise habits, violence, sexuality, and substance use. These data have also been used by researchers to evaluate the impacts of state-level policies. For examples, refer to Tremblay and Ling (2005), Carpenter and Cook (2008), Carpenter and Stehr (2008), Cawley *et al*. (2007), and Anderson (2014).

[6]In order to link respondents to their state of residence, we obtained the restricted-use versions of the national YRBS.

[7]Roughly half of these states have given the CDC permission to release their data. To obtain the remaining data, direct requests were made to each state.

DOI: 10.1002/hec

Table II. Descriptive statistics, 1999–2011

	National YRBS		State YRBS		
	Meth Project = 1	*Meth Project* = 0	*Meth Project* = 1	*Meth Project* = 0	Description
Dependent variable					
Meth use[a,b]	.0430	.0595	.0444	.0572	=1 if respondent has ever used meth, =0 otherwise
Independent variable					
Age under 15[a,b]	.1030	.0944	.1104	.1328	=1 if respondent is under 15, =0 otherwise
Age 15	.2344	.2245	.2605	.2586	=1 if respondent is 15, =0 otherwise
Age 16	.2681	.2581	.2664	.2647	=1 if respondent is 16, =0 otherwise
Age 17[a,b]	.2433	.2620	.2333	.2233	=1 if respondent is 17, =0 otherwise
Age 18 or older[b]	.1512	.1610	.1294	.1205	=1 if respondent is 18 or older, =0 otherwise
Male[a,b]	.5030	.4892	.4927	.4865	=1 if respondent is male, =0 if respondent is female
Grade 9	.2483	.2449	.2804	.2819	=1 if respondent is in grade 9, =0 otherwise
Grade 10	.2515	.2463	.2674	.2684	=1 if respondent is in grade 10, =0 otherwise
Grade 11[b]	.2572	.2562	.2472	.2395	=1 if respondent is in grade 11, =0 otherwise
Grade 12[b]	.2410	.2514	.2023	.1931	=1 if respondent is in grade 12, =0 otherwise
Ungraded[b]	.0020	.0011	.0026	.0171	=1 if grade is 'ungraded', =0 otherwise
Black[a,b]	.1291	.2215	.0732	.1359	=1 if respondent is black, =0 otherwise
White[a,b]	.3594	.4293	.6345	.6273	=1 if respondent is white, =0 otherwise
Other race[a,b]	.5116	.3492	.2923	.2368	=1 if respondent is of another race, =0 otherwise
Unemployment rate[a,b]	8.831	6.176	7.120	5.811	State unemployment rate
N	5610	95,136	37,426	497,233	

Means are based on unweighted data from the national and state YRBS
[a]Statistically different at 5% level for the national YRBS.
[b]Statistically different at 5% level for the state YRBS.

contributed data before and after the adoption of their anti-meth campaign.[8] Table II provides descriptive statistics for the national and state YRBS samples. Means are reported by whether a Meth Project was present in the respondent's state of residence during the year of the interview. On average, Meth Project states have lower rates of meth use, a lower percentage of black students enrolled in their high schools, and higher unemployment rates.

Figure 1 presents trends in meth use based on the combined national and state YRBS data. It is apparent that meth use has been trending smoothly downward in all states during the period under study. If the Meth Project had an effect, then we would expect to see an acceleration of this trend as states began adopting the campaign. Figure 1 provides no evidence to support this hypothesis. If anything, the decrease in meth use appears to have slowed among adopting states after 2005, the inaugural year of the Meth Project in Montana.

To examine the relationship between the Meth Project and meth use among youths in a more rigorous fashion, we exploit the temporal and spatial variation in the adoption of these campaigns and estimate a standard difference-in-differences model. Specifically, our estimating equation is

$$Meth\ use_{ist} = \beta_0 + \beta_1 Meth\ Project_{st} + X_{ist}\beta_2 + v_s + w_t + \Theta_s \bullet t + \varepsilon_{ist} \quad (1)$$

where i indexes individuals, s indexes states, and t indexes years. The dependent variable, $Meth\ use_{ist}$, is equal to 1 if respondent i reported having ever used meth and is equal to 0 otherwise. The vector X_{ist} includes individual-level controls for age, sex, race, and grade, and the unemployment rate in respondent i's state.[9]

[8]In the combined national and state YRBS sample, we have full coverage for five of the eight Meth Project states. Idaho did not participate in the national or state YRBS in 1999, and Colorado did not participate in the national or state YRBS in 1999, 2003, and 2007. In addition, we only have data on Hawaii for 1999 and 2009 from the national YRBS. Hawaii conducted a state YRBS in 1999, 2005, 2007, 2009, and 2011. Unfortunately, our attempts at obtaining the state YRBS data for Hawaii were rebuffed.
[9]The regressions based on the combined YRBS sample also include a dummy variable that indicates whether the respondent was sampled in the national YRBS or the state YRBS.

DOI: 10.1002/hec

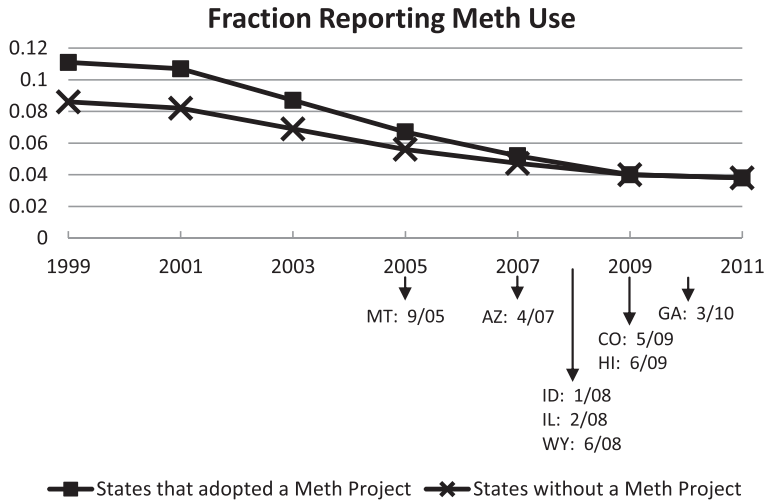

Figure 1. Fraction reporting meth use

Table III. Meth Projects and youth meth use

	National YRBS		State YRBS		Combined national and state	
Meth Project	−.0105	−.0045	−.0153**	−.0050	−.0162*	−.0016
	(.0194)	(.0081)	(.0074)	(.0064)	(.0083)	(.0059)
N	100,746	100,746	534,659	534,659	635,405	635,405
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
State FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State-specific trends	No	Yes	No	Yes	No	Yes

Each cell represents a separate OLS estimate based on data from the YRBS (1999–2011); the covariates are listed in Table II. The combined national and state YRBS regressions include a dummy variable indicating whether the respondent was sampled in the national YRBS or the state YRBS. Standard errors, corrected for clustering at the state level, are in parentheses.
*Statistically significant at 10% level **at 5% level ***at 1% level.

The vectors v_s and w_t represent state-fixed and year-fixed effects, respectively, and state-specific linear time trends are represented by $\Theta_s \bullet t$. The variable of interest, $Meth\ Project_{st}$, is an indicator for whether a Meth Project had been implemented by state s by year t.[10] All regressions are estimated as linear probability models, and standard errors are corrected for clustering at the state level (Bertrand *et al*., 2004).[11]

3. RESULTS

Table III presents estimates of Eqn (1) for the national, state, and combined YRBS samples. For each sample, results from specifications with and without state-specific linear time trends are presented. Figure 1 clearly illustrates the importance of controlling for pre-existing trends in meth use.

Using the state YRBS data and a specification without state-specific linear time trends, the adoption of a Meth Project is associated with a 1.53 percentage point decrease in the probability of meth use. The same

[10]This variable takes on fractional values during the year in which a Meth Project was adopted.
[11]Logit and probit models yielded similar results.

DOI: 10.1002/hec

Table IV. Sensitivity of results to sample selection

	National YRBS		State YRBS		Combined national and state	
Panel A: drop-treated states with only 1 year of pre-Meth Project data						
Meth Project	−.0123	−.0086	−.0192**	−.0072	−.0161*	−.0016
	(.0212)	(.0081)	(.0082)	(.0065)	(.0083)	(.0059)
N	98,927	98,927	514,752	514,752	634,863	634,863
Treated states in sample	AZ, GA, ID, IL		GA, ID, MT, WY		AZ, CO, GA, ID, IL, MT, WY	
Panel B: drop-treated states with 2 or fewer years of pre-Meth Project data						
Meth Project	−.0112	−.0066	−.0192**	−.0072	−.0172**	−.0032
	(.0225)	(.0074)	(.0082)	(.0065)	(.0085)	(.0059)
N	98,271	98,271	514,752	514,752	629,457	629,457
Treated states in sample	AZ, GA, IL		GA, ID, MT, WY		AZ, GA, ID, IL, MT, WY	
Panel C: drop-treated states with three or fewer years of pre-Meth Project data						
Meth Project	−.0112	−.0066	−.0089	−.0047	−.0087	−.0006
	(.0225)	(.0074)	(.0060)	(.0080)	(.0073)	(.0064)
N	98,271	98,271	494,124	494,124	608,645	608,645
Treated states in sample	AZ, GA, IL		GA, ID, WY		GA, ID, MT, WY	
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
State FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State-specific trends	No	Yes	No	Yes	No	Yes

Each cell represents a separate OLS estimate based on data from the YRBS (1999–2011); the covariates are listed in Table II. The combined national and state YRBS regressions include a dummy variable indicating whether the respondent was sampled in the national YRBS or the state YRBS. Standard errors, corrected for clustering at the state level, are in parentheses.
*Statistically significant at 10% level **at 5% level ***at 1% level.

specification yields a similar estimate using the combined YRBS data.[12] However, when state-specific linear time trends are included, these estimates become much smaller in magnitude and lose statistical significance.[13]

The state-specific linear time trends are included to avoid confounding the treatment effect with pre-treatment trends. However, when there are insufficient observations in the pre-treatment period, empirically disentangling the trends and the treatment effect becomes difficult (Wolfers 2006). To address this issue, we consider a series of sensitivity analyses in Table IV. Here, we restrict focus to treatment states with relatively more pre-treatment years of data. For example, in panel A of Table IV, we drop treated states with only 1 year of pre-Meth Project data; in panel C, we drop treated states with 3 or fewer years of pre-Meth Project data. In general, these results support the findings from Table III.[14]

In Table V, we consider whether the relationship between the Meth Project depends on age, gender, or race.[15] All estimates presented are based on specifications that include state-specific linear time trends. The results in panel A compare estimates for YRBS respondents who were under the age of 17 at the time of the

[12]We also experimented with using the wild cluster bootstrap method suggested by Cameron *et al*. (2008) to produce t-statistics. Wild cluster bootstrap critical values provide an asymptotic refinement and may work better than other inference methods for OLS when the number of clusters is small. Both of the statistically significant effects shown in Table III became statistically insignificant at conventional levels when using the wild cluster bootstrap procedure.

[13]For the national YRBS analysis, we considered weighted regressions using the sample weights provided by the CDC. These results were similar to those reported in Table III. Because the national and state YRBS data were not specifically designed to be pooled, we also experimented with including the interaction term, *Meth Project*National YRBS*, on the right-hand side of the estimating equation, where *National YRBS* is equal to one if the respondent was part of the national YRBS sample and equal to zero if the respondent was part of the state YRBS sample. This interaction term was never statistically distinguishable from zero, quelling some concerns about the viability of combining the two data sets.

[14]It is also important to note that the national YRBS data set represents a highly unbalanced panel. We experimented with running our national YRBS analyses on a sample where only states with one or fewer missing years of data were included. These results were very similar to those shown in Table III.

[15]Table AIII (available online) shows mean rates of meth use by age, gender, and race.

DOI: 10.1002/hec

Table V. Meth Projects and youth meth use by age, gender, and race

	National YRBS		State YRBS		Combined national and state	
Panel A: meth use by age						
	Age < 17	Age ≥ 17	Age < 17	Age ≥ 17	Age < 17	Age ≥ 17
Meth Project	−.0008	−.0058	−.0056	−.0045	−.0032	−.0015
	(.0069)	(.0155)	(.0048)	(.0093)	(.0042)	(.0085)
N	58,291	42,455	350,122	184,537	408,413	226,992
Panel B: meth use by gender						
	Male	Female	Male	Female	Male	Female
Meth Project	−.0129**	.0066	−.0039	−.0065	−.0003	−.0032
	(.0063)	(.0143)	(.0063)	(.0072)	(.0060)	(.0068)
N	49,366	51,380	260,351	274,308	309,717	325,688
Panel C: meth use by race						
	White	Non-white	White	Non-white	White	Non-white
Meth Project	−.0023	−.0012	−.0089**	.0040	−.0065	.0071
	(.0122)	(.0145)	(.0041)	(.0099)	(.0047)	(.0078)
N	42,855	57,891	335,649	199,010	378,504	256,901
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
State FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State-specific trends	Yes	Yes	Yes	Yes	Yes	Yes

Each cell represents a separate OLS estimate based on data from the YRBS (1999–2011); the covariates are listed in Table II. The combined national and state YRBS regressions include a dummy variable indicating whether the respondent was sampled in the national YRBS or the state YRBS. Standard errors, corrected for clustering at the state level, are in parentheses.
*Statistically significant at 10% level **at 5% level ***at 1% level.

interview with estimates for respondents who were 17 years of age or older. For both groups, the relationship between the Meth Project and meth use is consistently statistically insignificant.

Panel B of Table V provides estimates by gender. The relationship between the Meth Project and meth use among males is negative and statistically significant when based on the national YRBS data. In the state and combined samples, however, this relationship becomes statistically indistinguishable from zero.[16] There is no evidence that the Meth Project had an effect on female meth use.

Finally, the results in panel C of Table V provide estimates by race (i.e. white versus non-white). The relationship between the Meth Project and meth use among white high school students is negative and statistically significant in the state YRBS sample.[17] While this relationship becomes statistically insignificant in the combined sample, this may simply be because of the relatively small number of observations contributed by the treated states in the national YRBS data. Consequently, we leave open the possibility that the Meth Project had an effect on white students. There is no evidence that the Meth Project had an effect on meth use among non-white students.[18]

4. CONCLUSION

The Meth Project, an anti-methamphetamine advertising campaign, is intended to discourage meth use among young people. After Montana established the first campaign in 2005, seven other states adopted their own Meth

[16]The statistically significant effect for males in the national YRBS sample became statistically insignificant when using the wild cluster bootstrap procedure described by Cameron *et al*. (2008). It is important to note that the coefficient estimates for males across the national and state YRBS samples are statistically indistinguishable from one another.

[17]The statistically significant effect for whites in the state YRBS sample became statistically insignificant when using the wild cluster bootstrap procedure described by Cameron *et al*. (2008). It is important to note that the coefficient estimates for whites across the national and state YRBS samples are statistically indistinguishable from one another.

[18]To further address issues with combining the national and state YRBS data sets, we collected population data from the National Cancer Institute's Surveillance Epidemiology and End Results Program (http://seer.cancer.gov/popdata/). We used these data to assign population weights to each respondent based on state of residence, age, gender, and race. The idea of weighting using these data is to better ensure representation at the national level when estimating regressions based on the pooled national and state YRBS samples. The results based on this exercise support the finding that the Meth Project has not decreased meth use among teens (refer to Table AIV (available online)).

DOI: 10.1002/hec

Projects. Using data from the YRBS, Anderson (2010) found no evidence of a relationship between the Montana Meth Project and meth use among high school students.

We build upon the work of Anderson (2010) by using data from the national and state YRBS for the period 1999 through 2011 to examine the relationship between the Meth Project and meth use. During this period, eight states adopted anti-meth campaigns. While our results are typically consistent with those of Anderson (2010), we do find some evidence that the Meth Project may have reduced meth use among white high school students.

ACKNOWLEDGEMENTS

The authors would like to thank Dean Anderson, Daniel Rees, Randy Rucker, Carly Urban, and Mary Beth Walker for comments and suggestions. The authors would also like to thank Lisa Whittle and numerous state YRBS coordinators for their help with obtaining the data used in this paper. The authors have no financial or personal relationships between themselves and others that might bias their work.

REFERENCES

Anderson DM. 2010. Does Information Matter? The Effect of the Meth Project on Meth Use among Youths. *Journal of Health Economics* **29**: 732–742.

Anderson DM. 2014. In School and Out of Trouble? The Minimum Dropout Age and Juvenile Crime. *Review of Economics and Statistics* **96**: 318–331.

Bertrand M, Duflo E, Mullainathan S. 2004. How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics* **119**: 249–276.

Cameron AC, Gelbach JB, Miller DL. 2008. Bootstrap-Based Improvements for Inference with Clustered Errors. *Review of Economics and Statistics* **90**: 414–427.

Carpenter C, Cook P. 2008. Cigarette Taxes and Youth Smoking: New Evidence from National, State, and Local Youth Risk Behavior Surveys. *Journal of Health Economics* **27**: 287–299.

Carpenter C, Stehr M. 2008. The Effects of Mandatory Seatbelt Laws on Seatbelt Use, Motor Vehicle Fatalities, and Crash-Related Injuries among Youths. *Journal of Health Economics* **27**: 642–662.

Cawley J, Meyerhoefer C, Newhouse D. 2007. The Impact of State Physical Education Requirements on Youth Physical Activity and Overweight. *Health Economics* **16**: 1287–1301.

Cunningham Scott, Keith Finlay. 2013. Parental Substance Use and Foster Care: Evidence from Two Methamphetamine Supply Shocks. *Economic Inquiry* **51**: 764–782.

Dobkin Carlos, Nancy Nicosia. 2009. The War on Drugs: Methamphetamine, Public Health, and Crime. *American Economic Review* **99**: 324–349.

Siebel Thomas, Mange Steven. 2009. The Montana Meth Project: 'Unselling' a Dangerous Drug. *Stanford Law and Policy Review* **20**: 405–416.

Siebel Scholars. 2010. Meth Project Named Third Most Effective Philanthropy in the World by *Barron's* Magazine. Available at: http://www.siebelscholars.com/news/meth-project-named-third-most-effective-philanthropy-world-barrons-magazine.

Star-Tribune Editorial Board. 2010. Wyoming Meth Project is Making a Difference. *Star Tribune*. Available at: http://trib.com/news/opinion/editorial/wyoming-meth-project-is-making-adifference/article_ce543000-c3fb-5e4b-9934-7a0e69813b8f.html.

Tremblay Carol, Davina Ling. 2005. AIDS Education, Condom Demand, and the Sexual Activity of American Youth. *Health Economics* **14**: 851–867.

Wolfers Justin. 2006. Did Unilateral Divorce Raise Divorce Rates? A Reconciliation and New Results *American Economic Review* **96**: 1802–1820.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web site.

DOI: 10.1002/hec