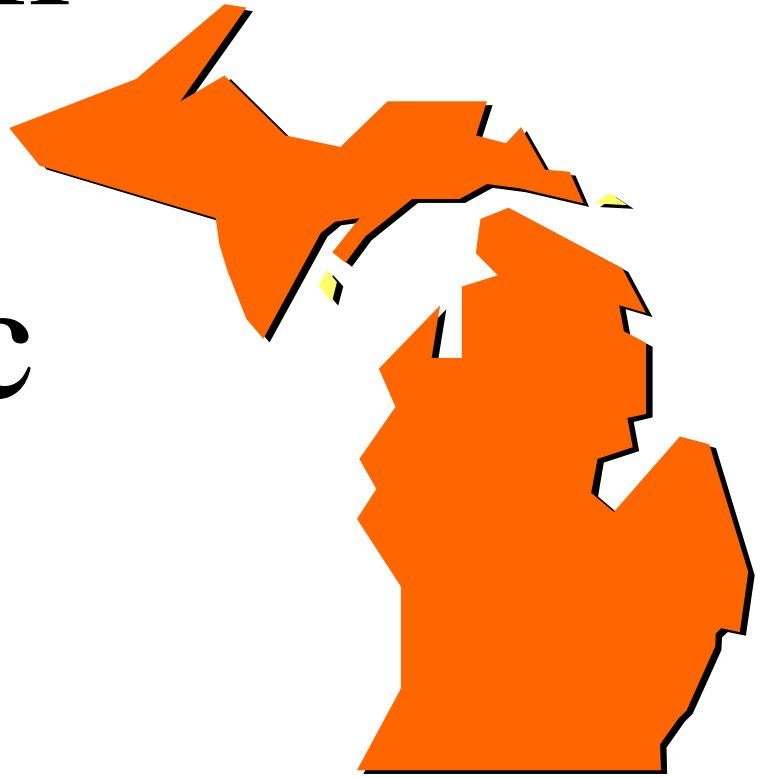


Michigan Journal of Public Health



Volume 4 Issue #1 2010
(ISSN) 1937-2515

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The mission of the Michigan Journal of Public Health is to promote public health practice, research and policy with specific focus on Michigan and the Great Lakes Region. We encourage contributions from the field of practice, original research, opinion and commentary. It is the expressed interest of this Journal to encourage dissemination from the field of public health practice.

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APA, 12 point font, Times New Roman double spaced, and, 1" margin. We offer a variety of submission categories in order to welcome a varied audience within public health.

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Research and Practice Articles (Up to 15 pages or 3500 excluding references, words in main text, a total of 4 standard digital photographs/tables/figures, and a structured abstract of 180 words) report the results of original quantitative or qualitative public health research. These may include, but are not limited to: evaluations/reports, demonstrations of innovative programs, best practice, exemplars/community-engaged scholarship, service learning, emerging problems, evidence-based practice and preliminary findings.

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In writing please follow these prompts:

Title: Write short, catchy titles that capture the reader's attention and highlight the uniqueness of the program.

Overview: In the first paragraph, give a brief overview of

- problem addressed;
- policy issues involved (local, state, federal, organizational);
- geographic location and the populations targeted;
- approach used to resolve the problem; and
- results obtained.

Description: Provide enough detailed information about the program/policy/issue to enable the reader to decide whether this effort could be replicated and what resources it would take to do so. Mention the history of the program/policy/issue and, if relevant, describe the key stages in program/policy/issue development, from acquisition of resources to current operational status. Interesting or unusual aspects of the program that merit a more detailed description, such as participant perspectives, staffing needs, volunteer training, special problems and solutions, or compelling situations may merit a more detailed description under a separate heading or as a sidebar box to the article.

Discussion and Evaluation: Summarize the evidence for the program/policy/issue's effectiveness. What has been most successful and most disappointing in your appraisal? What could have been done differently? What additional resources would have helped? Be explicit about funding sources and program/policy/issue costs.

Next Steps: Assess the viability/sustainability of the program and future challenges and opportunities. Comment on practical experiences and implications for other programs.

Key Findings: Use 3 or 4 bullets to highlight key outcomes and public health implications of the program. Write in lay terms easily understood by policymakers, the media, and readers outside of the field of public health.

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Julie Gleason-Comstock, PhD, CHES, Editor
ae4963@wayne.edu

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EDITORIAL

Editorship of a Public Health Electronic Journal: Profile of a Leader, Greg Cline, PhD

Julie Gleason-Comstock, PhD, CHES
Editor, Michigan Journal of Public Health



Greg Cline, PhD

In 2007, the American Public Health Association (APHA) presented its Committee on Affiliate Award to the *Michigan Journal of Public Health (MJPH)* Editorial Board, noting “Often, major projects, interesting research conducted locally, and recognition for local practitioners get overlooked at the national level” (APHA 2007). Dr. Gregory Cline’s trajectory from serving as President (2006 – 07) of the Michigan Public Health Association (MPHA) at the same time he provided leadership – and editorship – for establishment of *MJPH* - is worthy of recognition.

The *MJPH* was born in 2006 of a desire to provide a publication partnership for public health practitioners and academic faculty. As the founding Editor of the *Journal*, through Dr. Cline’s vision of the marrying of practice and academia, MPHA members were invited to use their expertise as members of an elected board which would conduct peer review of public health-focused manuscripts. An openly accessible electronic journal was envisioned and implemented, and an elected, voluntary Editorial Board, composed of MPHA membership representative of local and state public health, and university faculty with public health foci, grew and stabilized over four years. In January 2010, his *MJPH* mission accomplished, a new editor was elected, and Greg, with relief, remained as an Editorial Board member.

Dr. Cline has consistently pointed out the establishment of the *Journal*, which took a year and a half, was a team effort. The team includes partners such as Tarah Lantz, who serves as the *MJPH* desktop publisher. Greg will continue to tell you the evolution of the *Michigan Journal of Public Health* is an accomplishment attributable to the strong Editorial Board and the support of the Michigan Public Health Association. His public health service is ongoing as a member of the MPHA Board and editing the MPHA weekly web-based New Round-Up which is sent to MPHA members as well as posted on MPHA Facebook. He is currently an Assistant Professor at Grand Valley State University in Grand Rapids, Michigan.

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RESEARCH AND PRACTICE

Hookah: Prevalence, Perceived Harmfulness, and Factors Associated with Its Use among College Students

Dae Shik Kim, Ph.D. (corresponding author)
Western Michigan University

Patricia Tattersall, Ph.D.
Northern Illinois University

Theresa Green, M.S., M.B.A.
Berrien County Health Department

Margaret Richardson, LMSW
Western Michigan University

Amy B. Curtis, Ph.D., M.P.H.
Western Michigan University

ABSTRACT:

Introduction: Given the increased use and availability of hookah among the US college students, coupled with the health risks related to its use, the current study examined awareness and use of hookah among college students as well as what characteristics are related to the use of hookah.

Methods: The study utilized a self administered anonymous survey to gather information about hookah use from the students in an undergraduate general education class ($n = 108$).

Results: The survey results indicated that the large majority of students were aware of hookah, and nearly half of them had used hookah more than once. Level of social activity ($p = .016$) and perceived healthy lifestyle ($p = .042$) were the independent predictors of hookah use. The use of hookah was perceived as more harmful than alcohol use, but not as harmful as cigarette smoking.

Conclusions: The findings of this study can serve as a baseline for further studies on the subject, the results of which can lead to development of preventive programs targeting the populations that are most prone to hookah use.

Key words: hookah, water pipe, prevalence of hookah use, perception of harmfulness, factors related to hookah use

INTRODUCTION

Smoking hookah, which is the inhaling of a lit tobacco mixture through a waterpipe, has obscure origins but has been practiced for centuries in the Middle East (Tamim et al., 2003). The terminology for hookah varies depending upon region, which includes shisha, narghile, argile, hubble bubble, and goza among others (Moziak, Ward, Soweid, & Eissenberg, 2004). The main ingredient of hookah is *tumbak*, a dark paste tobacco lit by charcoal ember, which is placed on a tray on top of a pipe connected to a glass bottle half filled with water (Tamim et al., 2003). A burning charcoal is placed atop the tumbak, which is often soaked in molasses and mixed with fruit pulp and flavorings for creating aromatic smoke. Upon inhalation, the smoke passes through the waterpipe body, bubbles through the water in the bottle, and is carried through the hose to the smoker (Shihadeh, 2003).

The hookah smoke that emerges from the waterpipe contains substantial amount of toxicants known to cause lung cancer, oral cancer, heart diseases, and periodontal diseases (Natto, Baljoon, & Bergstrom, 2005; WHO, 2005; Radwan, Mohamed, El-Setouhy, & Israel, 2003). In addition, second-hand smoke from waterpipes is a mixture of tobacco smoke and the smoke from the fuel such as charcoal or wood cinders, which include high levels of carbon monoxide, heavy metals, and carcinogens (Maziak, Ward, et al, 2004, Sajid, Akhter, & Malik, 1993). However, there may be fewer perceived adverse health effects associated with hookah smoking than with cigarette smoking (Primack et al., 2008; Smith, Curbow, & Stillman, 2007), partly based on the notion of a filtering effect of water, through which the smoke passes before it is inhaled (Maziak, Fouad, et al., 2004; Shihadeh, 2003). Given such, it was important for this study to examine how hookah's harmfulness is perceived compared to other better known substances, including cigarettes and alcohol.

During the past decade, there has been a dramatic increase in hookah smoking in the Eastern Mediterranean region (Warren, Jones, Eriksen, & Asma, 2006; Rastam et al., 2004; Kandela, 2003). In a 2003 survey among a representative sample of hookah smokers in cafes/restaurants in Aleppo, Syria, most hookah smoking initiation was reported to have occurred during the 1990s across most age groups (Rastam et al., 2004). For example, in 2002, 43% of entering students at American University of Beirut reported they had used hookah at least once compared to 30% in 1998 (Chaaya et al., 2004). Another trend to note is that the habit of hookah smoking, which was traditionally limited to older men, spreading to other groups, particularly women and young adults (Maziak, Fouad, et al., 2004). An example of such phenomenon can be found in Tamim et al. (2003)'s 2001 survey, in which 32.4% of a proportionate random sample of university students in Lebanon indicated regular use of hookah.

With the increase in hookah smoking in the United States in the last decade (WHO, 2005), hookah cafes have opened across the United States (Lewin, 2006; Koch, 2005). Estimates of the number of hookah bars vary (Lewin, 2006; Koch, 2005), but as of October 2008, 470 hookah bars in the United States were listed on a hookah bar directory, and the number was growing by approximately five new hookah bars per month (Hookah-bars.com, n.d.). However, given the fact that many hookah bars are not listed in such directories, the actual number of hookah bars may be much larger (Pease, 2009).

Among a sample of 8,745 students in eight U.S. colleges that represented the south, northeast and western regions of the United States, 30% reported that they had tried hookah and 7% indicated the use of hookah in the past 30 days (Primack, Fertman, Rice, Adachi-Mejia, & Fine, 2009). In another survey conducted among the 602 undergraduate students in an urban university located in southeast Michigan, 15% reported they had used hookah at least once, and 5% stated they had used hookah more than 10 times in the past year (Grekin & Ayna, 2008). However, given the response rates of 28-30%, it is important to conduct further research to confirm these findings.

One of the reasons for increased use of hookah may be due to the social nature of its use. Previous studies conducted in the Middle East found that most hookah smokers initiated smoking with friends (Asfar, Ward, Eissenberg, & Maziak, 2005; Maziak, Eissenberg, & Ward, 2005; Maziak, Fouad, et al, 2004). Smoking hookah was strongly related to socialization with peers and leisure time activities (Maziak, Fouad, et al, 2004). The same study found that hookah smokers reported having more friends than non-hookah smokers, and were also more likely to have hookah-smoking friends (Maziak, Fouad, et al, 2004). Anecdotal evidence indicates that many young college students in the United States learn about hookah smoking through peers (Spear, 2005; Koch, 2005; Lewin, 2006), and they use hookah primarily at hookah cafes and in other group settings such as fraternity gatherings (Lewin, 2006). Primack, et al. (2009) reported that the college students who participated in organized sports were more likely to use hookah. This may be related to the social nature of hookah smoking, but few other empirical studies have been conducted in the United States to examine such social patterns of hookah users.

Given the increased use and availability of hookah among the US college students (Hookah-bars.com, n.d.; Lewin, 2006; Koch, 2005), it is important to identify potential predictors of hookah use. The current study examined the level of awareness of hookah, prevalence of use, perception of harmfulness of hookah, and the characteristics associated with hookah use among college students. Increased knowledge in these areas may serve to help focus prevention efforts on the populations that are most at risk for using hookah.

METHODS

Participants: A convenience sample of 195 male and female students enrolled in one section of a midwest university undergraduate general education course was used for this study. The study was approved by the university's Human Subjects Institutional Review Board (HSIRB) and was administered to consenting students at the end of one class period. After administration of the survey, all forms were mailed to two blinded investigators for separate data entry. Of the 121 students in attendance on the day of survey administration, 117 chose to participate; 108 of these surveys were complete and used for analyses (response rate of 55.4% according to the standard definitions by American Association for Public Opinion Research, 2009).

Measures: The survey questionnaire items were developed and piloted by the investigators based on the existing standardized tobacco survey instruments and similar surveys used in previous studies (Center for Disease Control and Prevention, 2001; Maziak, Ward, Afifi Soweid, & Eissenberg, 2005; Ward, Vander Weg, Relyea, DeBon, & Klesges, 2006). Questionnaire items assessed demographic factors, including age, gender, level of education, ethnicity of the student, ethnicity of the student's friends, and military experience. Participants' awareness and exposure

to hookah were assessed by the responses (true, false) to the following statements: 'I have never heard of hookah before this survey,' 'I know someone who uses hookah,' and 'I have been in a room where hookah was being used.' In addition, responses to the following question were used to examine the use of hookah among the participants: 'Which of the following best describes your experience with hookah? (I have never used hookah, I have used hookah only once, I have used hookah more than once but not regularly (i.e., not more than once a week), either currently or in the past I have used hookah regularly (i.e., at least once a week)).' We dichotomized the variable 'hookah use' by grouping the first two categories together, while combining the latter two categories. This was an attempt to focus our investigation on the use of hookah that was beyond a single (non-recurring) experimental trial.

Collected demographic information included age (<15, 15-19, 20-24, 25-29, 30-34, >35), gender, level of education (freshman, sophomore, junior, senior, other), race/ethnicity (Asian/Pacific islander, Black/African-American, Hispanic/Latino, White/Non-Hispanic, Arab/Middle Eastern, South Asian, other), race/ethnicity of friends, and military experience (yes, no). Data regarding socialization and healthy lifestyle behaviors were collected through the following questions: 'Over the past month, on average how many times a week did you engage in primarily social activities for longer than an hour at a time? (2 times or less per week, 3-5 times per week, 6-8 times per week, 9 or more times per week);' 'How often do you wear a seatbelt in the car? (always, almost always, often, occasionally, rarely, never);' 'Over the past month, on average how many cigarettes did you smoke in a week? (none, 1-10 cigarettes, 11-20 cigarettes, 21-40 cigarettes, more than 40 cigarettes);' 'Over the past month, on average how much time a week do you spend doing rigorous exercise? (less than 1 hour, 1-3 hours, more than 3 but less than 6 hours, 6 or more hours).' In addition, the following question was used to measure the participant's personal assessment of the healthiness of his lifestyle: 'In your opinion, do you lead a healthy lifestyle? (very healthy, somewhat healthy, not very healthy, unhealthy).'

The following question was used to assess the respondent's perceived healthiness/harmfulness of a list of behaviors: 'How would you rate each of the following items regarding the impact on your health, with "1" being very unhealthy and "7" being very healthy?' To measure how hookah use was perceived relative to other healthy/harmful behaviors, participants were asked to rate the harmfulness/healthiness of the four other behaviors (smoking cigarettes, drinking alcohol, exercising regularly, and socializing with friends) as well as that of using hookah.

Statistical Analysis: Frequencies were run on awareness, exposure, and use of hookah. Pearson Chi-Square tests were conducted on all social and lifestyle variables to examine their bivariate associations with hookah use.

Binary logistic regression analysis was conducted to determine independent predictors of hookah use. The model was built with the forced entry method. Given the explorative nature of the study, the model was built by first including all variables significantly associated with hookah use from bivariate analysis ($p < .10$). Then the non-significant variables were removed in backwards fashion, albeit with exceptions based on their potential significance in developing preventive programs. SPSS version 14.0 was used for all statistical analyses.

RESULTS

The sample consisted of 108 students with 55% being female ($n = 59$). Fifty three percent were 19 or under ($n = 57$), 46% were between 20 and 24 ($n = 50$), and 1% of the participants ($n = 1$) was older than 24. The sample was representative of all four undergraduate grade levels, ranging from a low of 17% seniors ($n = 18$) up to 37% sophomores ($n = 40$). The sample was racial/ethnically homogeneous, with 89% identifying as white ($n = 96$) and only 11% of the respondents ($n = 12$) identifying in any other category.

As shown in Table 1, 85% of the sample had heard of hookah. Nearly two-thirds of the respondents had tried hookah at least one time, with 10% having used it regularly.

Table 1
Frequencies of Awareness, Exposure, and Use of Hookah (N = 108)

	<i>n</i>	<i>% (95% CI)</i>
Awareness		
Have heard of hookah	92	85.2 (78.5 – 91.9)
Never heard of hookah	16	14.8 (8.1– 21.5)
Exposure to Other Hookah Users		
Know someone who uses hookah	75	69.4 (60.7 – 78.1)
Do not know anyone who uses hookah	33	30.6 (21.9 – 39.3)
Exposure to Environment Where Hookah Was Used		
Have been in a room where hookah was being used	66	61.1 (51.9 – 70.3)
Never been in a room where hook was being used	42	38.9 (29.7 – 48.1)
Use		
Have never used hookah	41	38.0 (28.9 – 47.1)
Have used hookah once	14	13.0 (6.7 – 19.3)
Have used more than once but not regularly	42	38.9 (29.7 – 48.1)
Have used regularly ^a	11	10.2 (4.5 – 15.9)

Note. ^a*Either currently or in the past, has used hookah regularly (at least once a week).*

Table 2 displays factors associated with level of hookah use. Those participants who smoke more than a pack of cigarettes per week were significantly more likely to have used hookah more than once ($\chi^2 = 12.68, p < .001$) than those who smoke a pack or less per week. Self-perception of healthy lifestyle showed a significant negative association with hookah use, with the respondents who declared unhealthy lifestyle (unhealthy, not very healthy) being more likely to have used hookah more than once ($\chi^2 = 12.05, p = .002$) compared to those who reported healthy lifestyle (very healthy, somewhat healthy). A greater percentage of respondents who engaged in primarily social activities at least 3 times a week reported multiple use of hookah compared to those who participated in such outings less than 3 times a week ($\chi^2 = 10.33, p = .006$). However, respondents' reported amount of rigorous exercise per week was not significantly associated with hookah use ($\chi^2 = 5.408, p = .144$).

Table 2*Lifestyle Events Associated with Hookah Use (N = 108)*

Lifestyle Event	Frequency of Hookah Use		Pearson Chi-Square	two-tailed p value
	Never Used or Used only Once	Used More than Once/Regularly		
	<i>n</i> (%)	<i>n</i> (%)		
Cigarette Use ^a				
1 pack or less/week	52 (59.1)	36 (40.9)	12.676	<.001
More than 1 pack/week	3 (15.0)	17 (85.0)		
Healthy Lifestyle ^b				
Not very healthy	4 (25.0)	12 (75.0)	12.047	.002
Somewhat healthy	38 (49.4)	39 (50.6)		
Very healthy	13 (86.7)	2 (13.3)		
Rigorous Exercise ^c				
Less than 1 hr/week	16 (48.5)	17 (51.5)	5.408	.144
1-3 hrs per week	16 (45.7)	19 (54.3)		
3-6 hrs per week	10 (43.5)	13 (56.5)		
More than 6 hr/week	13 (76.5)	4 (23.5)		
Social Outings of 1 Hour or More ^d				
Twice or less/week	13 (86.7)	2 (13.3)	10.334	.006
3 – 5 times/week	32 (49.2)	33 (50.8)		
6 or more times/week	10 (35.7)	18 (64.3)		
Ethnicity of Friends ^e				
Has friends of Middle Eastern descent	4 (23.5)	13 (76.5)	6.059	.013
Does not have friends of Middle Eastern descent	40 (44.0)	51 (56.0)		

Note. Results in the table are based on the responses to the following questions in the survey:

^a*Over the past month, on average how many cigarettes did you smoke in a week?* ^b*In your opinion, do you lead a healthy lifestyle?* ^c*Over the past month, on average how much time a week do you spend doing rigorous exercise?* ^d*Over the past month, on average how many times a week do you engage in primarily social activities for longer than an hour at a time?* ^e*Describe the ethnicity of your friends you frequently meet or talk to.*

The model's goodness of fit was acceptable ($\chi^2 = 4.350$, $p = .739$, Hosmer-Lemeshow test). Five outliers were identified (standardized residual values greater than 2), but none of the Cook's statistic and standardized DFBeta values were greater than 1, suggesting no unduly influential cases. VIF values for all predictors were between 1 and 1.3, indicating low multicollinearity between the predictors. Colinearity diagnostics also showed large loadings of variances on different dimensions, further indicating limited multicollinearity.

Table 3

Multivariable Analysis of Factors Associated with Multiple Hookah Use (N = 108)

	Odds Ratio	95% CI
Social Outings per week		
Twice or less	Ref	
3-5 times	9.18	1.5 – 55.5
6 times or more	16.52	2.4 – 111.3
Reported Life Style		
Unhealthy/ Not very healthy	Ref	
Somewhat healthy	0.48	0.1 – 2.4
Very healthy	0.07	0.0 – 0.7
Cigarette Smoking		
20 or less cigarettes per week	Ref	
21 or more cigarettes per week	3.53	.8 – 15.2
Perceived Harmfulness of Hookah	.70	.49 – 1.00

Note. CI = confidence interval. ^aHosmer & Lemeshow $\chi^2 = 4.350$ ($p = .739$). Cox & Snell $R^2 = .289$. Nagelkerke $R^2 = .385$. All the variables shown in the table have been included in the final model.

As shown in Table 3, the odds of multiple hookah use were 9 times greater for the students who engaged in at least an hour-long social outings 3-5 times a week compared to those who had two or less such weekly social outings, $OR = 9.2$ (95% $CI = 1.5 - 55.5$). Furthermore, the odds of multiple hookah use were almost 17 times greater for the students who engaged in social outings 6 times or more per week than those who were involved in two or less weekly social outings, $OR = 16.5$ (95% $CI = 2.4 - 111.3$). Table 3 also indicates that the students who declared their life style to be very healthy were far less likely to have used hookah multiple times compared to those who reported an unhealthy life style, $OR = .07$ (95% $CI = .0 - .7$). However, the students who reported their life style as somewhat healthy were not significantly different in hookah use from those who reported an unhealthy life style, $OR = 0.48$ (95% $CI = .1 - 2.4$).

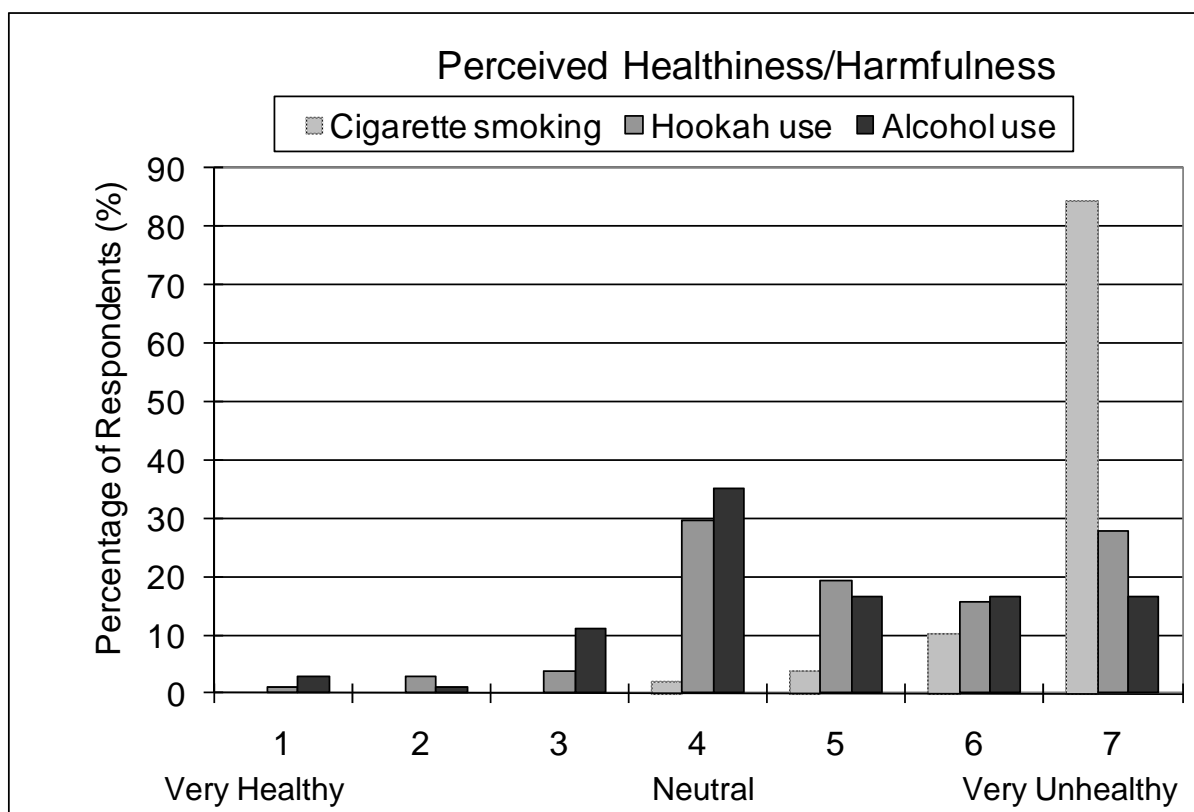
The odds of multiple hookah use were almost 4 times greater for the students who smoke an average of more than a pack of cigarette per week than for the students who smoke a pack or less than a pack of cigarettes per week, but was not statistically significant, $OR = 3.53$ (95% $CI = .8 - 15.2$). In addition, the odds of multiple hookah use decreased by 42% for each increase in hookah's perceived harmfulness scale (1-5), $OR = .70$ (95% $CI = .5 - 1.0$), but was also not

statistically significant. None of the demographic factors had a significant effect on hookah use once other independent predictors were controlled for.

Figure 1 shows the continuum of perceived harmfulness of cigarette smoking, hookah use, and alcohol use. The large majority of participants viewed cigarette smoking as at least mildly unhealthy (98.1%), with most (84.3%) considering it as very unhealthy. In contrast, perceived harmfulness of hookah use, as well as that of alcohol use, was more evenly distributed across the scale.

Figure 1

Comparison of Perceived Healthiness/Harmfulness between Cigarette, Hookah, and Alcohol Use (N = 108)



DISCUSSION

This survey, conducted to examine awareness and use of hookah as well as the factors associated with hookah use among undergraduate college students, found that the majority of students in the study were familiar with hookah, over half of them had tried it, and one in ten reported regular use. Perceived harmfulness of hookah use was similar to that of alcohol use but lower than that of cigarette smoking. Level of social activity and perceived healthy lifestyle were the independent predictors of hookah use.

In this study 59% of the students reported they have tried hookah at least once, which is much higher than what was reported in previous studies conducted on the U.S. college students (30% in Primack et al., 2009; 15% in Grekin & Ayna, 2008). Average age of the students included in these three studies was similar, but the percentage of male students in this study (45%) was higher than those of the previous studies (37% and 24%, respectively). Gender was not significantly associated with hookah use (either multiple or single) in this study, while it was significantly related to hookah use in a previous study (Primack et al., 2009), albeit only in a bivariate analysis; it did not turn out to be a significant independent predictor of hookah use once the other significant predictors were controlled for.

Potential difference in availability of hookah bars in the areas where the surveys were conducted could also have contributed to the difference in the level of hookah use among the three studies. In addition, the difference in response rate between this study (55.4%) and the previous two studies (28-30%) could have influenced the outcome. In other words, it is possible that a larger percentage of non-respondents (compared to respondents) tended to use hookah, contributing to the difference in percentage of students who have reported hookah use between the present and previous studies.

Hookah use was perceived as less harmful than cigarette use despite the fact that research supports the large intake of nicotine and toxins when using hookah (Natto, Baljoon, & Bergstrom, 2005; WHO, 2005; Radwan, Mohamed, El-Setouhy, & Israel, 2003); this result is consistent with the findings of Smith et al. (2007). It may be the method of delivery that generated the difference in perceived harmfulness between hookah and cigarette smoking. It is also possible that the pattern of use contributed to the difference in perceived harmfulness. In other words, the frequency of use (most hookah users consumed hookah less than twice a week whereas cigarette is generally used more frequently) might have defined the perceived level of harmfulness as opposed to the intensity of harmfulness per use. In addition, limited evidence of its addictiveness and carcinogenic risk might have impacted health education and public health policies related to hookah use and thus influenced public perception of its harmfulness.

Level of social activity was significantly associated with hookah use. This is consistent with the findings from previous studies that documented the use of hookah within a social context (Asfar et al, 2005; Maziak et al, 2005, Maziak, Fouad, et al., 2004). Given the hookah's Middle Eastern origin and the recent significant increase in regional hookah smoking (Warren, Jones, Eriksen, & Asma, 2006; Rastam et al., 2004; Kandela, 2003), it is not surprising that having close friends of Middle Eastern origin was strongly associated with hookah use in a bivariate analysis. However, the significance of this association diminished considerably once other factors were controlled, including level of social activity and healthy life style. It is possible that those who engage in a

large number of social outings have a pool of friends that are both large in number and diverse in ethnicity; such a scenario may explain why the friends' ethnicity didn't turn out to be an independent predictor of hookah use. It is also possible that the friends' ethnicity was not found to be a significant independent predictor of the outcome due to small sample size and homogeneous composition of the student body.

Perception of healthy lifestyle was also significantly related to hookah use. However, it was interesting to note that only the students who reported a very healthy lifestyle (rather than those who reported somewhat healthy lifestyle) were significantly less likely to use hookah than the participants who reported an unhealthy lifestyle. One of the possible explanations for this result is that avid health seekers may have avoided hookah use even at the hint of its harmfulness, while the students who reported a somewhat healthy life style did participate in hookah use given the perception of hookah's harmfulness that was far lower than that of cigarette smoking.

Although cigarette smoking was significantly related to hookah use in a bivariate analysis, it did not turn out to be an independent predictor of hookah use ($p = .09$). It appears that a relatively high correlation between healthy lifestyle and cigarette smoking ($r = -.378$) was partially responsible for this result. However, it is possible that this outcome might have been due to limited statistical power. Although cigarette use is considered a riskier activity than hookah use, the common nicotine content between the two activities may have contributed to the association between cigarette smoking and the use of hookah.

Perceived harmfulness of hookah did not turn out to be a statistically significant predictor of hookah use once the other predictors in the final model (level of social activity, perception of healthy lifestyle, cigarette smoking) were controlled for ($p = .06$). However, this may also have been due to limited statistical power. It appears that although some of the students used hookah despite its perceived harmfulness, the majority of the students avoided using hookah more than once when they perceived it as harmful.

The present study used a small convenience sample, and only the students who attended the class the night of the survey were included. However, the response rate of 55.4% was substantially higher than that of previous studies conducted on the U.S. college students (Grekin & Ayna, 2008; Primack et al., 2009), which ranged from 28-30%. The homogeneity of race and age also limits generalizations to a larger population.

The findings of this study can serve as a knowledge base for further studies on the subject, the results of which can lead to development of preventive programs targeting the populations that are most prone to hookah use. Qualitative analyses would be advised to explore factors associated with hookah use that were not considered in the present study. In addition, since only a small percentage of the sample in the present study used hookah on a regular basis, the pattern of hookah use, which appears to be distinct from cigarette use, should be further explored to determine if level of perceived health threat associated with hookah use differs for those using often compared to casual users.

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RESEARCH AND PRACTICE

Evaluation of Prevalence, Transmission, and Prevention Methods of Salmonellosis from Pet Turtles in Michigan

Karina Ballester, DVM, MPH
Michigan State University, College of Veterinary Medicine,
National Food Safety and Toxicology Center

Edwin Vazquez, DVM, MS, A.
Michigan State University, College of Veterinary Medicine,
National Food Safety and Toxicology Center

Mahdi Saeed, DVM, PhD, MPH
Michigan State University, College of Veterinary Medicine,
National Food Safety and Toxicology Center

Paul C. Bartlett, DVM, PhD, MPH
Michigan State University, College of Veterinary Medicine,
National Food Safety and Toxicology Center

ABSTRACT:

The sale and distribution of turtles with a carapace smaller than four inches in diameter was banned by federal law in 1975 on the grounds that such animals were frequently associated with human *Salmonella* infections. However, the popularity of these small turtles as pets has resurfaced, and in many places in Michigan they are being sold illegally. This study was conducted in Michigan to determine the prevalence of *Salmonella* spp. in the most popular pet turtle species, *Trachemys scripta elegans* commonly known as red-eared sliders, and to evaluate the compliance of pet stores with laws concerning the sale of these animals. One hundred and fifty pet stores nearest to the center of five large cities in Michigan (30 each for Lansing, Detroit, Flint, Kalamazoo, and Grand Rapids) were contacted by phone.

During this study, it was found that 41% (7/17) of the stores that indicated that they sold turtles also sold small turtles. Those seven stores were visited and sanitary conditions, animal housing, client education offered, and requirements for sale were observed. Each of these stores sold the authors a small turtle without asking any questions. One store required the authors to sign a form stating that they were buying the turtle for educational purposes, but did not require any verification. Each of the turtles bought was tested for *Salmonella* carriage. Six out of seven (86%) purchased turtles were positive for *Salmonella* spp. Among the positive turtles, the serotypes found were *S. Litchfield* (2/7), *S. Norwich* (1/7), and *S. Welteverden* (1/7), one was confirmed as *Salmonella* but untypable and another was contaminated upon arrival at NVSL and not serotyped.

This study showed that the nationwide ban on the sale of turtles with carapaces smaller than four inches in diameter is not being adequately enforced in Michigan, and that the turtles being sold have a high prevalence of *Salmonella* carriage.

Key words: public health, epidemiology, reptile

INTRODUCTION:

Salmonellosis can be a serious disease, especially in infants, young children, the elderly, and the immunocompromised. Complications of this disease can be severe and can lead to septicemia and meningitis. The Centers for Disease Control and Prevention estimates that three to five percent of the up to six million cases of human salmonellosis each year may be attributed to exposure to reptiles (CDC, 2006). *Salmonella* infection has been long associated with turtles (Chionidi and Sundberg, 1981). Infected turtles are almost always totally healthy, but still carry the *Salmonella* organism and can transmit it to humans.

The sale and distribution of turtles with a carapace smaller than four inches in diameter was banned by law in 1975 by the U.S. Food and Drug Administration (FDA) (CFR—Title 21, Part 1240, Sec. 1240.62 (b)) because of growing evidence that it may be associated with human *Salmonella* infections, especially in children. It is believed that turtles of this size pose a higher risk of infecting children with *Salmonella* spp. because they can easily fit the animals in their mouths. The CDC estimates that since this ban was established, approximately 100,000 cases of salmonellosis are prevented annually. In recent years the popularity of these small turtles as pets has resurged (AVMA, 2007), and in many places small turtles are being sold illegally in spite of this regulation (CDC 2004, 2007, 2008). Recently, there has been an increase in reports of salmonellosis associated with exposure to turtles and other exotic reptiles (CDC, 2005, 2006, 2008; JAVMA News, 2001), including a multistate outbreak of *Salmonella* Paratyphi B var. Java associated with exposure to turtles during October 2007-January 2008. As of January 18, 2008, a total of 103 cases from 33 states had *Salmonella* isolates indistinguishable from the ones found in six turtles or the water from their habitats in the homes of case-patients in California, North Carolina, Ohio, and Wisconsin (CDC, 2008).

Salmonella commonly lives in the intestine of vertebrates and has been frequently reported in reptiles (Hidalgo-Vila *et al.*, 2006). Turtles sold as pets often come from breeding farms where turtles are housed in crowded ponds and nesting areas in a manner that often fosters *Salmonella* transmission (D'Aust *et. al.*, 1990). Also, uninfected turtles can become infected while housed with other turtles at the breeding farm, during shipment, at the pet store, or even at a pet owner's home. Despite the health risks, turtles have become increasingly popular as pets in recent years, perhaps due to a popular cartoon TV show regarding a group of young adult turtles with reputed martial arts training.

During the early 1970's, about 14 percent of *Salmonella* infections came from small pet turtles. In 1999, the CDC estimated that pet reptiles or amphibians were the source of about 93,000 *Salmonella* cases a year or 7 percent of all cases (CDC, Healthy PETS Healthy people).

The objective of this study was to determine how many Michigan stores sold turtles and under what conditions they were offered for sale. The authors sought to determine the prevalence of *Salmonella* spp. in the turtles, the most popular of which is the *Trachemys scripta elegans*, commonly known as red-eared sliders. Federal law states that viable turtle eggs and live turtles with a carapace length of less than 4 inches shall not be sold to the public; with the exception of animals used for bona fide scientific, educational, or exhibition purposes, or animals intended for export only. This law excludes marine species (families Dermachelidae and Chelonidae).

METHODS:

Pet Stores: One hundred and fifty pet stores nearest to the center of five large cities in Michigan (30 each city: Lansing, Detroit, Flint, Kalamazoo, and Grand Rapids) were located in an online directory and contacted by telephone. The following basic questions were asked during the phone calls:

- “Do you sell turtles?”
- “What kind of turtles do you have?”
- “What is their price?”
- “What size are they?”

The conversation varied slightly each time, depending on what the person at the pet store responded, but the same basic questions were always asked.

Following contact by phone, seven stores were selected for a visit because they claimed to have red-eared sliders for sale with a carapace length smaller than four inches. The following conditions were observed during the store visits:

- Accessibility of visitors to handle animals
- Turtle housing
- Hand cleaning facilities
- Posters or signs explaining risks or conditions for selling turtles smaller than four inches in length
- Client education regarding hygiene
- Conditions of sale
- Forms used, if any, before selling the turtles

Turtle Housing and Sample Collection: One turtle was purchased from each of the seven pet stores. The turtles’ carapace length was measured in inches from nuchal to supracaudal scute. Six of the animals were individually housed in 5x3x2 inches sterile plastic containers with distilled water to prevent cross-contamination and one larger turtle with a carapace length of 3.25 inches was housed in a 9x13x3 inches container under the same conditions. Because *Salmonella* shedding is intermittent, each turtle was housed for five days in this enclosure without a water change. After the five-day housing period, a 10 mL water sample was then collected aseptically for *Salmonella* culturing.

Culture, Isolation, and Serotyping: Each water sample was enriched in Tetrathione Broth (Difco™, Becton, Dickson and Company, Sparks, MD 21152, USA) at 37° C for 24 hours, cultured in XLT4 (Difco™, Becton, Dickson and Company, Sparks, MD 21152, USA) agar

medium at 37° C for 24 hours, and biochemically confirmed based on color change and the pattern of these changes in inoculated Triple Sugar Iron Agar slants (Difco™, Becton, Dickson and Company, Sparks, MD 21152, USA) after incubation at 37° C for 24 hours. The colonies suspected as being *Salmonella* based on morphology and color on Triple Sugar Iron Agar were tested serologically using group-specific *Salmonella* antisera (Becton, Dickson and Company, Sparks, MD 21152, USA) according to the instructions stated by the manufacturer.

Serotyping was performed by the United States Department of Agriculture, Animal and Plant Health Inspection Service's National Veterinary Services Laboratory (NVSL) in Ames, Iowa, USA.

RESULTS:

Seventeen of the 150 pet stores contacted by phone indicated that they sold turtles. Seven of these claimed to have red-eared sliders for sale that had a carapace length smaller than four inches. Those seven stores were visited and sanitary conditions, animal housing, client education offered, and requirements for sale of a small turtle were observed. The species of animals sold, other than turtles, was noted in order to determine if the retailer would require licensure by the United States Department of Agriculture, Animal and Plant Health Inspection Service under the Animal Welfare Act (AWA) (7 U.S.C. 2131 et seq.), and therefore receive regular veterinary inspections.

Each of these stores sold the authors a small turtle without asking any questions. None of these stores offered a verbal warning regarding the health risks or laws governing the sale of turtles. Only three of them posted warnings about the requirements for the sale of small turtles. Store #2 had a sign which stated "Less than 4 inches not sold as pets". Store #3 had a sign above the tank stating "Must be 18 and for educational purposes only, please ask" and required the signing of a form stating that the turtle was being purchased for educational purposes, but no verification of this was requested. Store #5 had a sign close to the tank stating "Must be older than 18, less than 4 inches only sold for education or exhibition".

As shown in Table 1, the animals sold were observed in order to determine if the store fell under USDA/APHIS jurisdiction for reasons other than the turtles sold.

Table 1
Comments and Observations

Store	Comments and Observations		
	Animals sold in the store	Turtles housed per tank	Information required to sell turtle with carapace smaller than 4 inches in diameter
1	Freshwater fish, birds, rodents, and reptiles including turtles.	7	None, turtle sold immediately.
2	Puppies, rodents, ferrets, fish, insects, crabs, snails, and reptiles including turtles.	10 (3 different species) *	None, turtle sold immediately.
3	Puppies, fish, birds, rodents, and reptiles including turtles.	12	Sold after signing health advisory sheet stating that the purchase was for educational purposes.
4	Fresh and saltwater fish and reptiles including turtles.	1	Sold turtle that measured 3.25 inches, as if it was bigger than 4.0 inches and stated "we can't sell them any smaller".
5	Rodents and reptiles including turtles.	5	None, turtle sold immediately.
6	Rodents and reptiles including turtles.	7	None, turtle sold immediately.
7	Puppies, kittens, amphibians, fish, rodents, insects, birds, and reptiles including turtles.	5	None, turtle sold immediately.

**Yellow-bellied slider (Trachemys scripta scripta)*, *red-eared slider (Trachemys scripta elegans)*, *map turtle (Graptemys spp.)* all smaller than four inches and housed in same tank.

Each of the turtles bought was tested for *Salmonella* carriage. Six of the seven turtles (86%) were positive on *Salmonella* culture according to color change when grown on Triple Sugar Iron Agar (Difco™). Two isolated colonies from each positive water/turtle sample were selected and serogroups were determined by slide agglutination. Two of the six positive turtles yielded two different serogroups each, for a total of eight isolates. Seven of these isolates were sent to NVSL for confirmation and serotyping; the other positive isolate was obtained at a later date and was not serotyped. For Store/Turtle #2, serogroups A and B were detected in the laboratory and were believed to be two different isolates. However, NVSL confirmed that both isolates yielded *S. Litchfield*. For Store/Turtle #3, serogroups B and C were detected in the laboratory. The

serogroup B isolate was confirmed as *Salmonella* by NVSL but they were unable to identify its serotype, while the serogroup C isolate was contaminated upon arrival at NVSL and not serotyped.

Table 2
Individual Results for Turtles Tested

Store/ Turtle	Turtle Size (in)	<i>Salmonella</i> Culture Result	Serogroup	Specific Serotype
1	1.25	Positive	B	Litchfield
2	1.15	Positive	A	Litchfield
			B	Litchfield
3	1.5	Positive	B	<i>Salmonella</i> (untypable)
			C	Contaminated
4	3.25	Positive	B	Norwich
5	1.25	Negative	-	-
6	1	Positive	A	Welteverden
7	1.25	Positive	E	Not serotyped

Educational materials or verbal communication of the risks of handling reptiles were scarce. Forty-two of the 150 stores contacted which did not have small turtles for sale stated that they did not have them because it was illegal to sell them (42/150, 28%), and five stated that the reason was because they posed a risk of diarrheal illness (5/150, 3%).

DISCUSSION:

The modern turtle farming business reportedly started in Louisiana during the depression with turtles captured from the swamps (Hidalgo-Villa *et. al.*, 2006). Since the mid 1980s, more than 95 million pet turtles have been sanitized in the egg with antibiotics in these farms and exported for the pet store trade to other states and countries. This operation is certified *Salmonella*-free by the Louisiana Department of Agriculture & Forestry. D'Aoust and collaborators examined turtles imported into Canada from Louisiana for the presence of *Salmonella*. Of 28 lots of allegedly "*Salmonella*-free" turtles, 21% harbored *Salmonella*. The widespread use of gentamicin on turtle farms to produce *Salmonella*-free eggs for export has apparently encouraged development of antibiotic resistance in bacterial strains. Of 37 *Salmonella* strains isolated, 30 (81%) were gentamicin-resistant (D'Aoust *et. al.*, 1990). This finding of antimicrobial resistant strains of *Salmonella* is a serious public health issue that makes the high *Salmonella* prevalence an even greater public health hazard.

Turtles that are successfully sanitized with antibiotics while in the egg can nevertheless become contaminated with *Salmonella* shortly after birth. Previous studies have shown that the efforts to make turtles *Salmonella*-free have been ineffective (D' Aoust *et. al.*, 1990), and perhaps have even given customers a false sense of security. In addition, the turtles that were observed for sale at pet stores were housed with many other turtles, possibly from various sources, and the aquatic medium has proven to be a favorable environment for *Salmonella* persistence,

transmission (Polo *et. al.*, 1999), and proliferation (Unpublished data, Ballester *et. al.*). Therefore, all turtles housed in the tank at that time or after the last thorough sanitation of the tank will essentially be exposed to the same aquatic microflora.

Attempts to culture reptiles for *Salmonella* are sometimes not successful because of intermittent shedding. However, the *Salmonella* organism can reportedly remain viable in the environment for up to 30 months and, in general, the aquatic medium is considered a favorable environment for its transmission (Polo *et. al.*, 1999). These factors combined with inappropriate husbandry and sanitation can lead to high-risk environments for acquiring salmonellosis.

For this study, only stores near the center of five major Michigan cities were contacted. Seventeen (11%) of the stores contacted indicated that they sold turtles. From these, nine (53%) sold small turtles, but only seven (41%) of the stores had them for sale during the months they were contacted for this study. Also, multiple websites were found where individuals can readily purchase small turtles in a very convenient fashion. The authors suspect that in Michigan small turtles could be even more accessible than this study determined.

Salmonella serotypes isolated from the turtles in this study were *S. Litchfield*, *S. Norwich* and *S. Welteverden*. Woodward *et. al* conducted a study in Canada from 1991-1996 in which they studied the association of exotic pets with human cases of salmonellosis, and they also isolated *S. Litchfield* from one of the patients who was associated with a pet turtle. Although *S. Litchfield* has been repeatedly implicated in *Salmonella* outbreaks in produce (CDC, 2008 a & b), the authors were unable to find any other reports of *S. Litchfield*, *S. Norwich*, or *S. Welteverden* associated with turtles.

CONCLUSION:

This study showed that the nationwide ban on the sale of turtles with carapaces shorter than four inches is not being adequately enforced in Michigan. Even though small turtles were only found for sale in seven (41%) of the 17 stores that indicated they sold turtles, the purchase of these animals was largely without restrictions and only in one instance involved a very limited amount of education.

The following are simple steps recommended by the CDC (CDC, 2009) that should be taken to reduce the chances of acquiring salmonellosis from a pet turtle:

- Observe thorough sanitation while handling a turtle:
 - Wash hands immediately after handling a turtle or being exposed to its environment and before contacting any other surfaces, including your body.
 - Clean the turtle's tank and change its water frequently.
 - Do not change the water in the same area where food is prepared for human consumption.
 - Do not allow the turtle and the turtle's water near your mouth.
- Do not have a turtle in a household with immunocompromised individuals such as children under five years old, the elderly, or people who have lower natural resistance to disease due to pregnancy, cancer, AIDS, chemotherapy, organ transplants, diabetes, liver problems, or other diseases.

In many households, children will be held accountable for the caretaking of their pets and cannot be expected to follow these rules every time. Taking this into account and the fact that *Salmonella* spp. can live on the surface of these animals, the CDC recommends that households with young children or immunocompromised individuals do not keep reptiles or amphibians as pets (CDC, 2009).

During this investigation, it was observed that enforcement of current laws regarding the sale of pet turtles in Michigan is deficient and that small turtles can still be acquired at pet stores locally and can also be bought online. In Michigan, the responsibility for enforcing this regulation falls on the Michigan Department of Agriculture. Their inability to properly enforce this law may likely be due to an increase in enforcement responsibilities while undergoing repeated major budget cuts. Based on this study's findings, the authors recommend that resources be provided so that current laws and health recommendations regarding pet turtles be enforced.

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BRIEFS

Exploring the Public Health Continuum from Practice and Evaluation to Community-Based Participatory Research

Julie Gleason-Comstock, PhD, CHES
Wayne State University

Talat Danish, MD, MPH
Wayne County Department of Health

Richard Douglass, PhD,
Eastern Michigan University,

Since its inception in 2006 by the Michigan Public Health Association (MPHA), the *Michigan Journal of Public Health (MJPH)* has served as a peer-reviewed publication bridge between public health practice and academic partners in Michigan and its Great Lakes affiliates. This relationship is reflected in the composition of the Editorial Board, which includes representation from state and local public health, as well as expertise from major academic institutions. Additionally, MPHA collaboration in promotion of the annual Michigan's Premier Public Health Conference has provided a forum for presentation of public health practice, evaluation and research. In partnership with the conference planning committee and to further community-wide dissemination, invited 2009 Conference poster presentations are published in this 2010 *MJPH* issue. They reflect a range of public health practice, evaluation, research and program development in keeping with the *MJPH* mission.

To further explore the continuum of public health through community-based participatory research (CBPR), the *Journal* is issuing a **call for papers** which reflect CBPR values, innovation and leadership. CBPR can be defined as partnerships between health professionals, academics and community members throughout formative and summative processes which result in shared knowledge and experiences. This tenet of mutual respect has the potential to promote public health capacity building and systems change. A critical element is the balancing of research with practice, putting research into action and evaluating what we do in practice. CBPR benefits can include culturally competent measurement tools, enhanced data quality and quantity, and more accurate adaptation of best practices (Viswanathan, 2004). Detail of the call for papers will be posted on the MPHA/*MJPH* website in May, 2011 (www.mipha.org).

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Prostate Health Education and Awareness for Native American Men

Noel Pingatore, BS, CPH

Native American men living in the Northern Plains Region, which includes Michigan, suffer higher Prostate Cancer incidence and mortality rates compared to Native American men living in other regions of the US. The Inter-Tribal Council of Michigan, the Michigan Department of Community Health, and the Michigan Cancer Consortium developed a Native American-specific Prostate Health Awareness Education Campaign. The materials used in the campaign have been developed with community input via focus groups and health care provider interviewers. For more information, visit natamcancer.org.

**PROSTATE CANCER
DOESN'T JUST
AFFECT YOU;
IT AFFECTS
YOUR ENTIRE FAMILY**



Integrating Diabetes Primary Prevention into the Michigan WISEWOMAN Program

Kristi Pier, MHS
Michigan Department of Community Health

The objective of the WISEWOMAN program was to integrate diabetes primary prevention activities into an existing chronic disease program delivered through nine local health departments in 27 Michigan counties. Between October 2007 and December 2008, 2,925 WISEWOMAN participants received screening blood glucose tests; 179 had glucose values in the prediabetes range, and 43 previously undiagnosed women had values in the diabetes range. Based on pilot data, it was concluded that integration of chronic disease programs is possible at the state level and can be translated to the local level by using data to define need and establishing measureable objectives.

Integrating Diabetes Primary Prevention into WISEWOMAN

Kristi Pier¹, Robin Roberts¹, Elaine McDonald², Lori Corteville¹

¹Michigan Department of Community Health (MDCH), ²Lenawee County Health Department

Objective

To integrate diabetes primary prevention activities into an existing chronic disease program, reaching a high risk population.

Why diabetes prevention?

- Evidence that diabetes prevention reduces risk for people identified with prediabetes
- Modest lifestyle changes improve glucose levels for people with prediabetes – 30 minutes of moderate physical activity 5 days a week and 5-7% weight loss
- WISEWOMAN participants are at high risk of prediabetes and diabetes
- Evidence-based lifestyle changes fit well with WISEWOMAN program structure
- Maximize resources and impact by collaborating and joining forces of two “like-minded” chronic disease programs

Design

Establish pilot project in Lenawee County Health Department WISEWOMAN program to 1) determine if glucose testing is compatible with program structure, and 2) integrate lifestyle activities to promote physical activity and weight loss.

Methods

- Between October 1, 2006 – March 31, 2008, all Lenawee WISEWOMAN participants were given the pen and paper American Diabetes Association (ADA) risk assessment.
- Participants determined to be at high risk were offered glucose testing
- Participants identified with prediabetes were offered a tailored curriculum based on the Diabetes Primary Prevention Curriculum

Results of WISEWOMAN Pilot Project

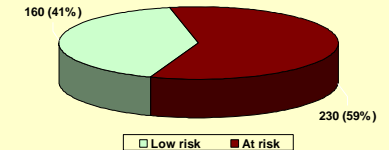
Participants enrolled for first visit between October 1, 2006 and March 31, 2008.

- 392 WISEWOMAN participants were seen and eligible
- 275 had a fasting blood glucose test
- 73 identified with prediabetes
- 11 identified with diabetes

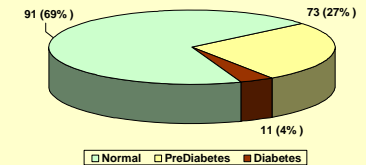
73 participants received prediabetes prevention messages

- 57 were seen again for follow-up 1 year later

Paper risk assessments:
“At risk” = 2 or more factors out of 8 or first degree relative with diabetes.

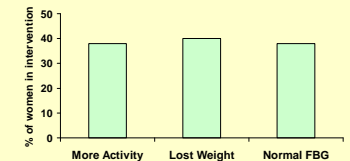


Fasting Blood Glucose tests:
Women in the prediabetes range were 4 times more likely to be obese than women who had FBG values in the normal range.



Intervention Impact:

Approximately 80% of women experienced at least one positive change in their lifestyle and/or health as a result of intervention.

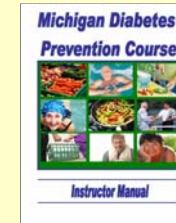


Integration Outcomes

The Lenawee pilot project demonstrated the need for and feasibility of glucose testing and education in the WISEWOMAN program. Statewide testing was phased in through all local programs:

Statewide testing 10/1/07 – 3/31/09

- Glucose tests – 3,729 (1,097 fasting)
- Prediabetes – 288 (26%)
- Diabetes – 99 (9%)



To address lifestyle activities statewide, MDCH developed a standardized instructor training 5-session Michigan Diabetes Prevention course:

- Adapted from the Diabetes Prevention Program 16-session curriculum
- Focuses on nutrition, physical activity and goal setting messages
- 51 new instructors trained since August 1, 2009

The Use of GIS Mapping in Targeted Health Surveillance Efforts for Illicit Drug Use in Detroit, Michigan

Gerry Polverento, BS,
Wayne County Medical Examiner Office

Using GIS mapping, a cluster study of the locations of deaths due to the use of illicit drugs, specifically; heroin, cocaine, and fentanyl, in Detroit has been conducted. This mapping shows the spatial relationship of Detroit neighborhoods using temporal and location change maps where incidences of death from illicit drug use has occurred and is meant to demonstrate where targeted police, drug interdiction, and health surveillance efforts could offer the most impact.

This presentation outlines the use of a geographic information system (GIS) in implementing the model and producing maps and statistics to assess the outcome of this model. GIS illustrates the structure of drug use, how it is spatially organized, shows the spatial relationship of the locations where incidences have occurred due to the use and/or abuse of illicit drugs, and assesses the model using temporal and location change maps and statistics.



Using GIS Mapping to Illustrate the Correlation Between Drug Use and Homicides in Wayne County - 2008

Gerry Polverento, B.S. & Carl Schmidt, M.D., M.P.H.

Using geographic information system (GIS) mapping, a cluster study of the locations of deaths due to the use of heroin or cocaine and incidences of homicides in Wayne County has been conducted. This mapping illustrates the structure of heroin and cocaine deaths as well as homicides in Wayne County and shows the spatial relationship of the locations where incidences of death have occurred. This poster attempts to show the correlation between areas of cocaine and heroin use and incidences of homicides and illustrates where targeted police, drug interdiction, and health surveillance efforts could offer the most impact.

All incidences depicted are from 2008.



Development of a CBPR Protocol for an IDU Focus Group on Overdose Prevention and Naloxone Training & Distribution

Julie Gleason-Comstock, PhD, CHES

Wayne State University (WSU) Department of Family Medicine &
Public Health Sciences and Center for Urban Studies (CUS), Office of the Provost

Opioid overdose is a leading cause of death among injection drug users (IDU). Naloxone is an effective opiate antagonist used by medical personnel for emergency resuscitation. To provide guidance for an urban public health initiative on naloxone training and distribution, a community health organization which operates a syringe exchange program, a local health department and a research university used an existing Community-Based Participatory Research (CBPR) relationship to develop a focus group protocol to receive input from IDU.

COMMUNITY-BASED PARTICIPATORY RESEARCH WITH AN INTRAVENOUS DRUG USERS FOCUS GROUP ON OVERDOSE REVERSAL



Julie Gleason-Comstock, PhD, CHES, Alicia Streater, PhD, Mark Sorbo, BA, Wayne State University (WSU)
Cindy Bolden Calhoun, Barbara Jones, Craig Miller, Community Health Awareness Group, Inc. (CHAG)
Luke Bergmann, PhD, City of Detroit Department of Health & Wellness Promotion (DHWP)



BACKGROUND

Opioid overdose is a leading cause of death among injection drug users (IDU). Naloxone is an effective opiate antagonist used by medical personnel for over thirty years for emergency resuscitation. Except for potential dope sickness, the drug has no side effects and no pharmacological effect when opiates are absent.

Recently community-based harm reduction programs have developed a training and distribution program in which injecting drug users themselves can administer naloxone in case of opiate overdose. Although it does not completely eliminate the need for medical intervention, the program can prevent unnecessary death from opiate overdose by allowing trained bystanders to inject naloxone immediately instead of using multiple ineffective methods to revive someone before calling 911. Studies show that injecting drug users are willing to and do use the naloxone to prevent overdose death and that it does not increase the frequency or quantity of opiates used.

Presentation: Michigan's Premier Public Health Conference, 2009

INTRODUCTION

A Community-Based Participatory Research collaborative between the City of Detroit Department of Health and Wellness Promotion, Community Health Awareness Group, Inc. and researchers from the WSU Center for Urban Studies, Office of the Provost, and the Department of Family Medicine & Public Health Sciences, School of Medicine, explored the feasibility of adapting the Chicago Recovery Alliance model for prevention of opiate overdose related death in the City of Detroit.

The opiate reversal program is planned as a natural expansion of services provided through CHAG's Life Points Harm Reduction Outreach program. Life Points has provided syringe exchange, HIV/AIDS and Hepatitis C risk reduction education, referrals to drug treatment and HIV/AIDS testing to injecting drug users and others through mobile street outreach since 1996. The naloxone distribution program will be implemented through Life Points in late 2009.

METHODS

In preparation to implement this program, sixteen intravenous drug users (IDU), all registered members of the Life Points program, participated in one of two focus groups. Questions explored the IDU typical injecting environment, experiences with drug overdose and their opinions about using naloxone in the community. Prior to the group, all participants completed a brief survey and watched a 10 minute video about naloxone.

PARTICIPANT CHARACTERISTICS

- 56% Female
- Race/Ethnicity
 - 44% African-American
 - 38% White, non Hispanic
 - 12% White, Hispanic
 - 6% American Indian
- Age
 - 25- 30 (12%)
 - 31- 39 (12%)
 - 40 – 49 (38%)
 - 50 + (38%)
- Education
 - 8th grade or less (13%)
 - Some high school (25%)
 - High school graduate/GED (38%)
 - College (25%)



Length of Time in Syringe Exchange Program



RESULTS

INJECTING ENVIRONMENTS

- 80% of the respondents said they inject primarily in private locations
 - Usually with friends and in their own homes
 - 44% usually inject with a regular injecting partner
- Only 25% ever injected in a shooting gallery.
- 31% always inject alone
 - Most like privacy when using; don't like others watching while inject
- Many expressed feeling safe when they get high by themselves because they can't afford enough dope to put them over the top or they always buy from someone they know.

OVERDOSE EXPERIENCES IN THE LAST 12 MONTHS

- 75% knew someone who overdosed at least once
- 19% had overdosed themselves
- Most often the OD occurred in their own house

USUAL RESPONSES TO OVERDOSE

- Actions taken
 - Shake or slap them around
 - Walk them around
 - Place ice water on genitals; keep temperature down
 - Rescue Breathing
- Reasons for inaction: fear of arrest
 - "People end up dying (from overdose) because people are afraid they will be charged with murder or maybe they have warrants so they don't want to take them to the hospital."
 - "They should have amnesty like you have for babies for people who OD. You could be charged for murder. Ease up on people when they drop off someone who OD'd"

WILLINGNESS TO USE NALOXONE AND INFORM OTHERS

- 100% were willing to carry and use naloxone when witnessing an OD
- "Even if I was high... it would wake me up, blow my high so I would be able to deal with it."
- "You can work it out with someone where you say" I've got this and you give that so that if one of us falls out, you can hit me..."
- "They we still have a heart and conscience, even if we don't know each other, we would do it."



Seeking Services from the Life Points Van



Acknowledgement: Chicago Recovery Alliance

A Systems Approach to Implementing the EnhanceFitness Program in Michigan

Karen McCloskey
Michigan Department of Community Health

EnhanceFitness (EF) is an evidence-based physical activity program for older adults. EF is proven to increase strength, boost activity level and elevate mood. To embed EF in a statewide delivery system, the Michigan Department of Community Health (MDCH) Arthritis Program (MAP) partnered with YMCAs. YMCAs are ideal partners – they have expertise in program marketing and delivery, and also attract and sustain an instructor base. They have a desire to offer programs at offsite locations to reach, more effectively, the communities they serve. YMCAs also share a common interest in health promotion and disease prevention.

The MDCH began working with the YMCA of Lansing (YOL) in 2007 to develop a model that could be replicated with other YMCAs. YOL offers the EF program at both branch locations and offsite community locations such as churches and senior centers. Expanding programming to community locations has allowed YOL to reach participants they might not normally reach. Since the time this poster was published, the YOL has expanded the number of EF locations and is now offering classes at eight community locations and two of its five branches. As a result of this success, the MAP established partnerships with the YMCA of Metropolitan Detroit and with the YMCA of Greater Grand Rapids, each of which is now offering EF at four locations.



A Systems Approach to Implementing the EnhanceFitness® Program in Michigan



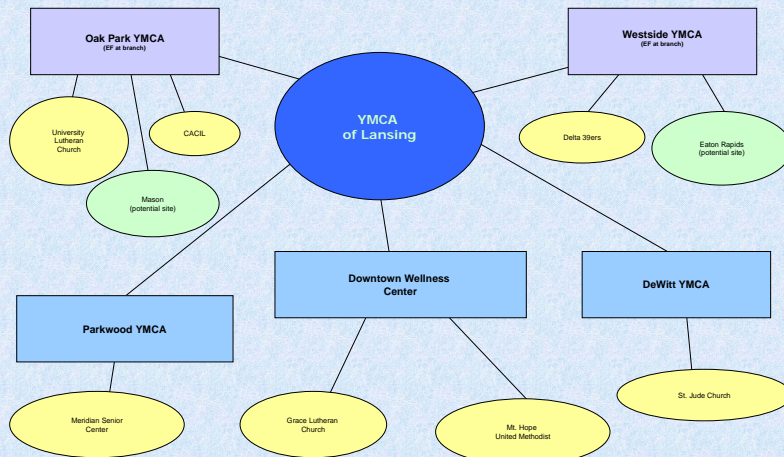
Judith Swiss Lyles, Steven Springer, Karen McCloskey, & Elizabeth Anderson - Michigan Department of Community Health

The Program: EnhanceFitness® (EF) is an evidence-based physical activity program for older adults. EF is proven to increase strength, boost activity level, and elevate mood.

The System: To embed EF in a statewide delivery system, the Michigan Department of Community Health (MDCH) Arthritis Program partnered with YMCAs (Ys). Ys are ideal partners because:

- 1) They have expertise in program marketing and delivery
- 2) They attract and sustain a well-trained instructor base
- 3) They have a desire to offer programs at offsite locations to effectively reach the communities they serve
- 4) Ys share a common interest in health promotion and disease prevention
- 5) The numerous Ys across Michigan facilitate statewide implementation

YMCA and EnhanceFitness® in Lansing



June 25, 2009

EnhanceFitness® Sites in Michigan



The Impact: The MDCH began working with the YMCA of Lansing (YOL) in 2007 to develop a model that could be replicated with other YMCAs. The YOL's branches partner with offsite community locations such as churches or senior centers to offer EF to participants that the Y would not normally reach. The YOL is now offering EF classes at seven community locations and in 2 of the 5 branches. Due to this success, the Michigan Arthritis Program established a partnership with the YMCA of Metropolitan Detroit and with the YMCA of Greater Grand Rapids.

Lessons Learned:

- o Obtain buy-in from top Y management which is communicated clearly to branches and program directors
- o Identify a program champion within the Y structure for program adoption and implementation
- o Identify a Y point person responsible for communicating with state arthritis program partners
- o Clarify roles and procedures for each step of program implementation
- o Communicate the importance of program fidelity to all levels
- o Establish frequent and ongoing communication between partners

Next Steps: Continue to partner with the YMCA to implement EF in other communities including: Jackson, Flint, Ann Arbor, Alpena, and Muskegon. Also, will work to expand implementation of EF through other systems partners including: Centers for Independent Living, Area Agency on Aging of West Michigan and related aging networks, and the National Kidney Foundation of Michigan.

Establishing an Academic Division Supporting Public Health Medical Direction

Molly Polverento, MS
College of Human Medicine, Michigan State University

In 2008, the Family Medicine Department in MSU's College of Human Medicine established a new Division to provide support to Medical Directors working in local public health. We will summarize the current status of medical direction, the goals and activities of the program, and how we are working to help bridge public health, clinical medicine, and academia.

Establishing an Academic Division Supporting Public Health Medical Direction

Molly E. Polverento, MS and William Wadland, MD, MS



Introduction

BACKGROUND:

The Preventive Medicine and Public Health Division was established to create new linkages among local health department medical directors, Michigan State University, and the Michigan Department of Community Health to improve the delivery of public health services. The PMPHD works collaboratively with other public health and preventive medicine programs in Michigan to complement current efforts and support medical direction for local public health departments. The PMPHD also works closely with MSU community teaching sites and other MSU community resources to identify opportunities for program and research collaboration that will strengthen public health medical direction in Michigan's communities.

OBJECTIVES:

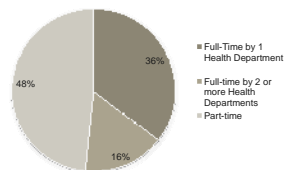
- Support enhanced networking of local health department medical directors through regular meetings and sharing of resources, promoting learning and problem solving.
- Link local health department medical directors with the MSU community campuses and teaching hospitals of the Colleges of Human Medicine, Osteopathic Medicine, and Nursing.
- Provide opportunities for professional development, training, and continuing education for Michigan physicians working in public health.
- Promote learning experiences and scholarly projects in public health for health professionals in training.
- Identify and secure additional financial support for the division.

Development of the Division

Current problems facing the public health workforce, including challenges in recruiting and retaining qualified professionals, has been well documented. In 2007, the Institute of Medicine found that there was a growing shortage of public health workers, including physicians, and that many currently working in public health are inadequately prepared for existing and emerging public health challenges. The same report estimated a shortage of 20,000 public health physicians nationally.

These national challenges were evident in Michigan, where all local health departments are required to employ a public-health trained physician to provide medical direction. A 2007 survey of Medical Directors showed that at least 8 (24%) may leave practice by January 2009, creating an immediate need to identify qualified physicians who could fill these anticipated vacancies. Stakeholders participating in strategic planning meetings for the Division in 2007 and 2008 identified both economic and educational challenges for recruiting and retaining qualified public health physicians.

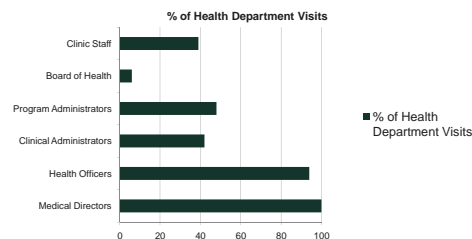
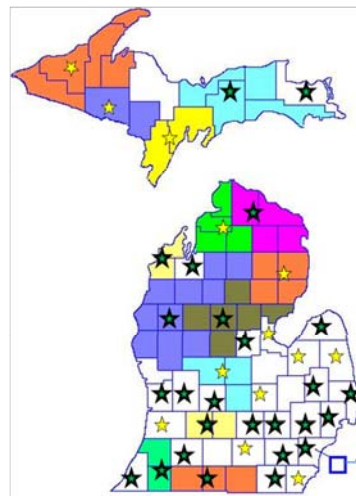
The challenge of funding medical direction is evident in the varied arrangements local health departments have adopted to fill these positions. Current Medical Directors typically fall into one of three categories: employed full-time by one health department, employed full-time between two or more health departments; and employed part-time.



Division Activities

In September 2008, the Division hosted a two-day conference of Medical Directors and other key stakeholders to introduce this new initiative. This meeting provided an opportunity to orient Medical Directors to multiple community-based initiatives at Michigan State University relevant to their role in their communities and to gather insights from Medical Directors regarding the direction of the Division.

To follow-up on the discussions from the September 2008 meeting, the Division Coordinator completed in-person visits with Medical Directors in their home communities. These meetings often included Health Officers, nursing staff, and other program staff. By the end of September 2009, visits took place with 28 of the 31 current Medical Directors.



Project Outcomes

In the first year of operations, the Division staff focused on building relationships with local health departments, particularly Medical Directors, and identifying local needs and opportunities for collaboration. Common themes which emerged during the local health department visits included:

- Many health departments no longer employ an epidemiologist, relying on their regional bioterrorism epidemiologist to assist when needed. This impacts the ability of the health department to fully analyze the data they collect, which could be used to identify community health trends, develop more effective interventions, and target additional funding.
- The populations being served by health departments are changing, which is putting stress on some services, particularly at a time of fewer resources. Michigan's communities are aging, creating new programmatic needs for health departments which have traditionally focused on maternal and infant health needs. Also, populations that are newly seeking services because of worsening economic conditions are putting a strain on existing services. As a result, local health departments are looking to partners to try and best meet these new community needs.
- There is widespread agreement that physicians need more and/or better training on public health, including the variety of the programs and services provided by local health departments. Informants from multiple health departments shared examples of limited physician knowledge of services or the role of public health in the community and limited understanding of the role of the physician in public health. Suggested topics for inclusion in physician education on public health include: infectious and communicable disease reporting, environmental health, and local health department governance.
- Many local health departments are interested in involvement in research projects; however, they are most interested in being equal partners in the development and execution of projects. Informants from some smaller health departments stated that they may be too small to seek larger grants on their own, but would be interested in collaborating with other health departments on larger projects as long as the project was designed to meet mutual interests of the communities involved.

Findings from the health department visits will be used by the Division to prioritize and shape new activities. A summary of visit findings will also be shared with key stakeholders, including local and state public health leadership. Key outcomes from the first year of the Division include:

- Division staff has assumed responsibility for the maintenance of the website and listserv for the Michigan Association of Public Health and Preventive Medicine Physicians (MAPPP). The membership of this organization includes all local Medical Directors. This facilitates communication and information sharing among Medical Directors.
- As of September 2009, 17 local Medical Directors hold a clinical appointment with Michigan State University. This connection to MSU community campuses will be critical as the Division moves forward with educational opportunities in public health for medical students and residents.
- Several Medical Directors have been engaged in grant development with MSU Faculty. This includes a project initially proposed by one Medical Director and commitment from four other Medical Directors to serve on Community Advisory Boards proposed in another grant.
- The 2009 retreat of the Family Medicine Residency Network, a program of the MSU-CHM Family Medicine Department, focused on building bridges among public health, clinical practice, and academic medicine. Three Medical Directors attended this event, which included presentations on all-hazards preparedness, aging and public health, and mental health and substance abuse.

Conclusion

The Preventive Medicine and Public Health Division has established relationships with public health professionals throughout Michigan. The information gathered through its outreach activities will be used to strategically develop the Division, focusing on opportunities to increase collaboration between local health departments and MSU resources and to seek necessary funding through grants and other avenues to provide the support. Planned activities include educational opportunities for Medical Directors, grant and other project development, and educational placements of medical students and residents in public health agencies.

For additional information please contact:

Molly Polverento, MS
Department of Family Medicine
College of Human Medicine, Michigan State University
Molly.polverento@hc.msu.edu

MICHIGAN STATE
UNIVERSITY

College of
Human Medicine

Establishing an Academic Division of Geriatrics and Gerontology

William Wadland, MD, MPH
College of Human Medicine, Michigan State University

The increasing number of older adults in the population poses a significant challenge to our health care system, including public health, and its economic viability. The demographics of Michigan make the state particularly vulnerable to this trend. With its statewide community campus system and over 20 years of experience as a leader in geriatrics education, MSU is well suited to help address the healthcare needs of Michigan's growing elderly population.

Establishing an Academic Division of Geriatrics and Gerontology

William Wadland, MD, MS; Mary Noel, MPH, PhD, RD; David Solomon, PhD



INTRODUCTION

Objective

Establish an administrative division on Geriatrics and Gerontology in the Department of Family Medicine within the College of Human Medicine (CHM) at Michigan State University (MSU). Form a network of geriatric fellowships with a common core curriculum, coordinated performance assessment program and evaluation system.

Rationale

The increasing number of older adults in the population poses a significant challenge to our health care system and its economic viability. The demographics of Michigan make the state particularly vulnerable to this trend. With its statewide community campus system and over 20 years of experience as a leader in geriatrics education, MSU is well suited to help address the healthcare needs of Michigan's growing elderly population.

ADMINISTRATION

Objective

Develop and implement an administrative division for geriatric medicine training among participating MSU affiliated family medicine and internal medicine residencies located throughout the State of Michigan.

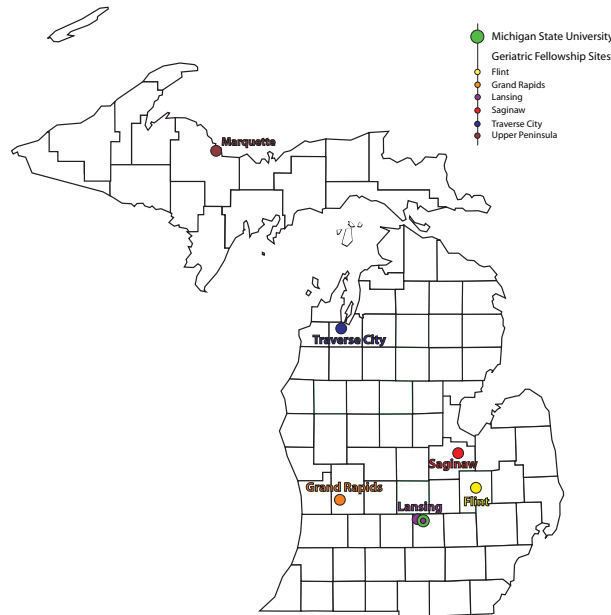
Fellowship Network Structure

Five affiliated family medicine residency programs located throughout the State have requested help in establishing geriatric fellowships. Coupled with two existing geriatric fellowships within CHM's statewide network of affiliated family medicine residency programs, we are forming a statewide coordinated geriatric fellowship consortium. By sharing resources with a coordinated curriculum and evaluation program, the consortium can provide an efficient high quality educational for Michigan's next generation of leaders in geriatric medicine.

The Geriatric Fellowship Steering Committee oversees fellowship consortium and is comprised of the Division Director, the Director of the Geriatric Education Center of Michigan, the fellowship directors of each affiliate program and the geriatrics division administrator. The Chair of Family Medicine is an ex-officio member of the steering committee.

Geriatrics and Gerontology Program Health Research Council is a multidisciplinary group of researchers from family medicine, internal medicine, osteopathic medicine, nursing, social work, psychology, sociology and nutrition that meets monthly to share ideas and develop new research projects. The council members serve as mentoring resource for geriatric fellows across the fellowship network.

Geriatric Clinical Council is made up of lead clinical representatives from the affiliated fellowship programs in the network and will discuss issues related to the quality of a successful practice in geriatric medicine such as extended care policies and protocols, consultative services, medical director leadership and problem solving.



CURRICULUM

Objective

Create a jointly developed modular distance learning curriculum designed to prepare geriatric fellows for successfully completing the Certificate of Added Qualifications (CAQ) examination. The curriculum will consist of:

- Self-Instructional Modules each containing a digital presentation, series of related articles and a feedback quiz.
- Interactive Virtual Conferences that consist of monthly sessions including journal club and case-based conferences using conferencing software to connect faculty and fellows at the different fellowship locations.
- Yearly Geriatrics Education Day Conference held at one of the fellowship sites in which all of the consortium fellowships would participate. The agenda would involve an invited keynote speaker, presentations of the fellows' research projects and other interactive training sessions.

ASSESSMENT OF FELLOW COMPETENCY

Objective

Develop a set of fellow evaluations that would be available to network programs for evaluation and providing feedback to their residents and fellows.

- Certificate of Added Qualifications (CAQ) Examination
- Research Project (for each Fellow)
- Four Case Performance Based Assessment (PBA)
 - A. Team-building
 - B. End of Life
 - C. Polypharmacy
 - D. Dementia / Delirium

EVALUATION

Objective

Document the impact of the patient care provided to the elderly by the newly developed geriatric fellowship positions within the network of affiliated programs.

- Demographic data
 - Number of fellows
 - Number students and residents in geriatric programs
 - Descriptors and demographics of geriatric clinical services
 - Assessments of clinical teams on CQI, both inpatient and outpatient
- Database Tracking with local and comprehensive databases
 - Rate of hospitalizations of elders
 - LOS of hospitalizations
 - Rate of hospital re-admissions
 - Assessment for pharmacotherapy use and cost in extended care facilities
 - Incidence of falls and hip fractures
 - Adverse drug reactions and interactions
 - Incidence of pseudo-dementia and delirium
 - Hospital discharge prescriptions of elders



A New Paradigm for Public Health – the HIPPER Model

Yvonne E. Anthony, PhD, MBA, MHA
City of Detroit Department of Health and Wellness Promotion

The Detroit Department of Health and Wellness Promotion will describe the development and implementation of the Office of Health Information, Planning, Policy, Evaluation and Research (HIPPER). HIPPER is an interdepartmental collaborative unit designed to improve the operational infrastructure, institutional cultural dynamic and capacity for public health services through health education, planning, policy, evaluation and research. Operations are optimized when collaborations are strategically approached from an interdisciplinary perspective utilizing epidemiologists, policy analysts, health educators and researchers.

A New Paradigm for Public Health - the HIPPER Model



Yvonne E. Anthony, PhD, MBA, MHA, Margaret Tufts, MPH, Jaye I. Bond, MPH, MPP
and William Ridella, MPH, MBA

Staff of Detroit Department of Health and Wellness Promotion

ABSTRACT

The Office of Health Information, Planning, Policy, Evaluation, and Research (HIPPER) at the Detroit Department of Health and Wellness Promotion (DHWP) is an interdepartmental collaborative unit designed to improve the operational infrastructure, institutional cultural dynamic and capacity for public health services. HIPPER is based on a modified version of the Interorganizational Relations Theory in which interdepartmental disciplines are combined to implement a more comprehensive and coordinated approach to public health. HIPPER's work is carried out by a centralized team of Epidemiologists, Biostatisticians, Health Educators, Policy Analysts, Program Evaluators and an Internal Research Advisory Board. The HIPPER team's efforts to improve effectiveness and efficiency at DHWP are achieved by working in collaboration with other DHWP units to provide statistical and epidemiological expertise and analyses; technical leadership for research initiatives and evaluation plans; guidance in developing health information campaigns; analysis and monitoring of health-related legislation; development of health policy implications and recommendations; and technical support for the departmental strategic planning process. The centralization of different disciplines expands the department's ability to address health issues beyond one area of public health, while enhancing the sense of shared responsibility throughout the department. In addition, the HIPPER model maximizes the use of existing resources by coordinating services and access to new information, ideas, materials and other types of capital. The HIPPER model is a unique and innovative approach to public health that has set a standard for multi-sector collaboration and has allowed for the achievement of more organizational goals at DHWP.

BACKGROUND

In 2007, A Public Health Workforce Skills and Training Needs Assessment Survey was conducted at the Detroit Department of Health and Wellness Promotion (DHWP) to help identify the competency levels of employees, gaps in resources and training, and collaborative programs within DHWP. The results of these assessments revealed that:

- The varying units within DHWP operated in silos; and
- Cross-sharing of information and resources between departments was minimal

As a result of this needs assessment, a new objective was added to DHWP's strategic plan, which was: to improve the operational infrastructure of the department by creating a unit dedicated to organizational planning, evaluation and data management. In the process of developing this unit, the need to include policy development, health information and research materialized as needed components of any public health effort.

To achieve this new goal of improved operational infrastructure, the Office of Health Information, Planning, Policy, Evaluation, and Research (HIPPER) was created in the summer of 2007.

CREATION OF HIPPER

Principles of the Interorganizational Relations Theory (IOR), which HIPPER is based upon:

- Recognizes the intraindependence and need for coordination among departments
- Organizational goals are more likely to be achieved through collaboration
 - Access to new information, ideas, materials and other resources
- Collaboration optimizes coordination of resources (time, staff and expertise)
- Positive attitudes and norms toward cooperation and collaborations
- Ability to address issues beyond one discipline of public health

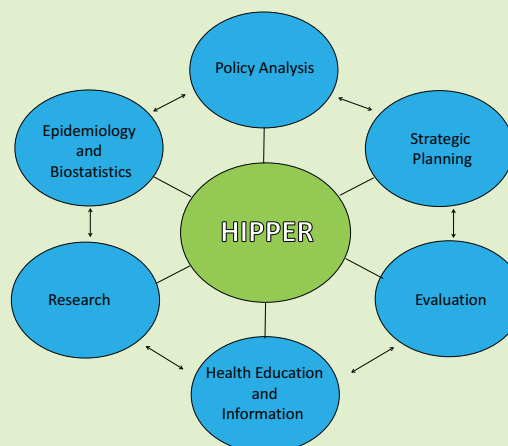
Adjustments made to the IOR for HIPPER to better meet the needs of the department:

- Theory modified to be INTRA-organizationally focused
- A organizational model that ties the traditional disciplines of public health together in a interdisciplinary, centralized way
 - Central repository of information and data for DHWP.
- Allows for cross fertilization and collaborations among the various statistical and epidemiological expertise which improves the overall quality of data management and support for DHWP.

HIPPER STAFF

Director	Public Health Policy Analyst
Principal Epidemiologist	Evaluator
Lead Poisoning Epidemiologist	Office Assistant
Maternal and Child Health Epidemiologist	
Senior Statistician	
General Epidemiologist	

Six Functional Areas of HIPPER



HIPPER Responsibilities

Health Information:

- Provide health promotion information
- Promote DHWP programs and services
- Coordinate health promotion events
- Provide Health Reference Library services

Strategic Planning:

- Provide "coaching" to Strategic Implementation Committee
- Evaluate strategic planning process through a quarterly report card system
- Provide technical assistance as needed

Policy

- Develop and facilitate execution of DHWP's policy agenda
- Prepare policy briefs, policy analysis and position papers as needed
- Promote policy advocacy activities

Evaluation:

- Design and implement evaluation plans for units within DHWP
- Provide process and outcome evaluation services to all DHWP programs
- Provide training to DHWP staff on program evaluation methods and techniques

Research

- Conduct epidemiological studies
- Provide institution-wide epidemiological and statistical support services
- Develop DHWP's research agenda
- Provide statistical analysis, data management, and grant writing services to units at DHWP
- Facilitate DHWP's Research Review Committee

PRODUCTS OF HIPPER

- Annual Data Book
- Annual Report
- Quarterly Indicator Reports
- Bi-Annual Community Profiles
- Monthly Activity Reports (by Division)
- Annual Lead Surveillance Report
- Annual MCH Surveillance Report
- Annual Infant Mortality Profile
- Fetal Infant Mortality Review Report
- Policy Briefs & Memos
- Position Papers
- Evaluation Reports
- Grant Preparation & Submission
- Quarterly Strategic Planning Report Cards
- "News You Can Use" Weekly Email Alerts
- Learning Labs & Information Resource Center
- Technical Assistance & Training
- Research Briefs, Presentations & Publication

THE HIPPER LOGIC MODEL

