Oregon Windsurfer and Kiteboarder Health Study Report

Background

Columbia River Gorge is a world-renowned destination for windsurfing and kiteboarding ("surfing"). Windsurfers and kiteboarders ("surfers") have reported respiratory ailments and skin infections after surfing in the Columbia River Gorge in recent years. To delineate the kinds of symptoms reported and to evaluate potential health risks related to surfing in Columbia River Gorge, we surveyed a cohort of windsurfers, kiteboarders, and nonsurfers (i.e., persons who neither windsurf nor kiteboard) monthly during May–September, 2008.

Methods

Through surfer groups, posters, and public media, we recruited a convenience sample of surfers and healthy nonsurfers 18–70 years old. Nonsurfers had to be residents of Oregon or Washington in 2008. Surfers could be residents of other places as long as they would mainly surf in the Columbia River Gorge during our study period. One baseline and four follow-up surveys were administered monthly from May to September via the internet. In the baseline survey, we collected information on demographic characteristics, surfing characteristics (for surfers only), current chronic health conditions, and beliefs on the water quality in the Columbia River and Oregon Coast and the association between water quality and illness. In the follow-up surveys, we collected information on surfing activities (for surfers only) during the past month and last outing of surfing and incidence of primary health outcomes of concern. The primary health outcomes included upper respiratory symptoms (sinus infection or pain, stuffy or runny nose, and coughing), eye and ear infections, skin symptoms (skin rash, skin infection, and poor healing of wounds), and gastrointestinal symptoms (diarrhea, vomiting, and abdominal pain).

Incidence rates were calculated as symptoms per 100 person-months. Poisson regression models were used to compare symptoms among surfers and nonsurfers as well as among those who surfed in the Columbia River Gorge and those who surfed in other places during their last outing of surfing. The effect of sex, surfing month, and related baseline health conditions (chronic sinusitis and pollen allergy adjusted for upper respiratory symptoms; cancerous or precancerous skin lesions adjusted for skin symptoms; chronic otitis adjusted for eye and ear infection) was adjusted for all multivariate models.

Statistically significant level was set at $\alpha=0.05$, which means that if a *P*-value is less than 0.05, the difference is considered statistically significant.

Results

Baseline characteristics

Of 114 surfers and 94 nonsurfers enrolled, 86 (75%) surfers and 84 (89%) nonsurfers completed all five surveys. As shown in Table 1, surfers and nonsurfers were comparable at baseline in age, health status, and antecedent beliefs regarding an association of water quality with illness, but differed markedly with regard to sex, education, and residence. Compared to nonsurfers, a higher proportion of surfers were male and reported living in Hood River County. About one-third of surfers and nonsurfers rated the quality of Columbia River water “poor” or “very poor” (Table 1).

As shown in table 2, compared to nonsurfers, a higher percentage of surfers reported chronic sinusitis (16% versus 1%) and cancerous or precancerous skin lesions (10% versus 1%) (both $P_{\text{-value}}<0.001$). Pollen allergy was the most commonly reported baseline health condition, with a prevalence of 32% among surfers and 26% among nonsurfers; this difference was not statistically significant. The prevalence rates of asthma and arthritis were less than 10% in both surfers and nonsurfers.

As indicated in Table 3, surfing-related characteristics of windsurfers and kiteboarders at baseline. Forty-four percent of surfers reported windsurfing, 39% reported kiteboarding, and 17% reported both. Nearly two-thirds of surfers reported windsurfing or kiteboarding for more than five years, and 75% of surfers reported having “advanced” or “professional” skills in windsurfing or kiteboarding. More than half of surfers reported dunking their head under water “very often” or “quite often.” Helmets and life preservers were the most commonly worn protective gear, but 51% of surfers seldom or never wore a helmet, and 70% seldom or never wore a life preserver. More than 90% of surfers seldom or never wore an ear plug or nose clip. In terms of likelihood of taking risks when surfing, 28% surfers reported "almost always" seeking challenges.

Incidence of reported symptoms

During the follow up from June through September, upper respiratory symptoms were those most frequently reported by both surfers and nonsurfers. On average, each surfer reported 2.5 episodes of respiratory symptoms each month, 0.2 episodes of eye or ear infection, 0.5 episodes of skin symptoms and 0.3 episodes of gastrointestinal symptoms. Each nonsurfer reported an average of 0.6 episodes of respiratory symptoms each month, 0.03 episodes of eye or ear infection, 0.2 episodes of skin symptoms and 0.3 episodes of gastroenteritis symptoms. Among surfers, the incidence of each group of symptoms, and especially respiratory symptoms, peaked in June, declined in July and August, and reached its nadir in September. Among nonsurfers, no seasonal differences in the incidence of any group of symptoms were found (Table 4 & Figures 1-4).

Among respiratory symptoms, the incidence rate of stuffy or runny nose (lasting at least 24 hours per episode) was much higher than the incidence of sinus infection or of coughing. Ear infection was more common than eye infection. Among skin symptoms, poor healing of wounds and skin rash were more common than skin infection. Among gastroenteritis symptoms, diarrhea was more common than abdominal pain and vomiting. These findings applied to both surfers and nonsurfers.

Surfers were 3.9 times as likely as nonsurfers to report respiratory symptoms, 7.2 times as likely to report ear or eye infection, and 2.4 times as likely to report skin symptoms (Table 5). Surfers who reported pollen allergy at baseline were 80% more likely to report respiratory symptoms than those who did not report pollen allergy during the four-month period ($P_{\text{-value}}<0.001$). Surfers who reported chronic sinusitis at baseline were 70% more likely to report respiratory symptoms than those who did not report chronic sinusitis ($P_{\text{-value}}<0.001$).

As shown in Table 6, compared to surfing elsewhere during the last outing, surfing in the Columbia River Gorge was associated with a statistically significant 2.7-fold risk of developing respiratory symptoms. No statistically significant associations were found between surfing in the Columbia River Gorge and other symptoms.

Study limitations

This study has at least two limitations. First, the surveys were completed by a self-selected, convenience sample of windsurfers, kiteboarders, and non-surfers. The incidence rate estimates may not be generalizable to all surfers and the general public. Second, all estimates were based on self-reported data, and there was no validation of reported symptoms; in particular, we did not attempt to identify pathogens from reported cases of “infection.”

Conclusions

Windsurfers and kiteboarders reported higher rates of upper respiratory symptoms (especially stuffy or runny nose), ear or eye infection, and skin symptoms than nonsurfers. The incidence of upper respiratory symptoms among surfers was significantly higher in June and July than in August and September. Compared to surfing elsewhere, surfing in the Columbia River Gorge was associated with development of upper respiratory but not other symptoms. Among surfers, having allergy or chronic sinusitis was associated with a higher risk of respiratory symptoms.

The causes of the increased incidence of the aforementioned symptoms among surfers are unknown. Given that the primary upper respiratory symptom reported was stuffy or runny nose, that symptoms peaked in early summer and that they were associated with preexisting allergy, one plausible explanation is pollen allergens on the water. Environmental evidence on the seasonal change of pollen levels on the Columbia River may help to explain this hypothesis. Our findings also suggest that surfing in the Columbia River Gorge and other places might predispose surfers to infection, though mechanisms by which this might occur have not been studied.

Table 1 Demographic characteristics and attitudes of surfers and non-surfers, Oregon Windsurfer and Kiteboarder Health Study, May–September, 2008

Characteristics	Surfers		Non-surfers		*P*-value
	N	%	N	%	
Age, years					
20–35	28	25	30	31	0.19
36–50	55	48	34	36	
51-70	31	27	31	33	
Sex*					
Male	91	80	28	29	<0.0001
Female	23	20	67	71	
Education*					
Graduate degree	37	32	54	57	<0.01
College degree	60	53	33	35	
Less than college	17	15	8	8	
Residence*					
Oregon-Hood River County	39	34	7	7	<0.001
Oregon-Other County	37	32	69	73	
Washington and other places	38	33	19	20	
Health status					
Very good	86	75	63	66	0.29
Good	25	22	30	32	
Fair	3	3	2	2	
Water quality of Columbia River					
Very good or good	16	15	15	20	0.34
Fair	51	48	39	53	
Poor or very poor	39	37	20	27	
Water quality of Oregon Coast					
Very good or good	67	74	45	61	0.13
Fair	19	21	26	35	
Poor or very poor	4	5	3	4	
Association between water quality and illness					
Very likely	33	31	24	29	0.77
Somewhat likely	50	47	44	52	
Somewhat or very unlikely	23	22	16	19	

* The difference in prevalence between surfers and non-surfers was statistically significant.

Table 2 Prevalence of baseline health conditions among surfers and non-surfers, Oregon Windsurfer and Kiteboarder Health Study, May–September, 2008

Baseline health conditions	Surfers		Non-surfers		*P*-value
	N	%	N	%	
Pollen allergy	36	32	25	26	0.40
Chronic sinusitis*	18	16	1	1	<0.001
Skin cancer/pre-cancerous lesion*	11	10	1	1	0.01
Arthritis	8	7	6	6	1.0
Asthma	6	5	7	7	0.53
Chronic otitis	5	4	0	0	0.06
Chronic diarrhea	3	3	0	0	0.25
Chronic conjunctivitis	1	1	0	0	1.0
Chronic eczema	1	1	1	1	1.0
Diabetes	1	1	1	1	1.0

* The difference in prevalence between surfers and non-surfers was statistically significant.

Table 3 Surfing-related characteristics of windsurfers and kiteboarders, Oregon Windsurfer and Kiteboarder Health Study, May–September, 2008

Characteristics	N	%
Type of surfing		
Windsurfing	50	44
Kiteboarding	44	39
Both	20	17
Years of regular surfing		
Less than 1 year	2	2
1–2 years	17	15
3–5 years	24	21
More than 5 years	71	62
Surfing skills		
Beginner	5	4
Intermediate	25	22
Advanced	60	53
Professional	24	21
Frequency of dunking head under water		
Very often	15	13
Quite often	45	40
Seldom	44	39
Rarely	9	8
Frequency of wearing protective gear		
Helmet		
Always	32	28
Most of the time	13	11
Sometimes	11	10
Seldom	15	13
Never	43	38
Life preserver		
Always	24	21
Most of the time	4	4
Sometimes	6	5
Seldom	11	10
Never	68	60
Ear plugs		
Always	5	4
Most of the time	0	0
Sometimes	2	2
Seldom	2	2
Never	105	92
Nose clip/plugs		
Always	2	2
Most of the time	1	1
Sometimes	0	0
Seldom	4	3
Never	106	94

Goggles		
Always	10	9
Most of the time	3	3
Sometimes	5	4
Seldom	1	1
Never	94	83
Likelihood of taking risk when surfing		
Always play safe	12	10
Sometimes seek challenges	67	59
Almost always seek challenges	32	28
Don't know	3	3

Table 4 Incidence of symptoms among surfers and non-surfers by month, Oregon Windsurfer and Kiteboarder Health Study, May–September, 2008

Symptoms	Surfer				Non-Surfer			
	No. of episodes	Total person months	Incidence rate*	P_{trend}	No. of episodes	Total person months	Incidence rate*	P_{trend}
Upper respiratory symptoms								
June	245	68	360.3	<0.001	60	80	75.0	0.3
July	221	70.5	313.5		37	76	48.7	
August	133	66.5	200.0		37	75.5	49.0	
September	103	73	141.1		46	73.5	62.6	
Eye and ear infections								
June	24	87	27.6	0.03	4	90	4.4	0.41
July	17	89	19.1		3	83.5	3.6	
August	18	81.5	22.1		2	83	2.4	
September	9	84.5	10.7		2	84	2.4	
Skin symptoms								
June	55	85	64.7	<0.01	10	89.5	11.2	0.36
July	44	84	52.4		12	82	14.6	
August	27	79	34.2		21	81.5	25.8	
September	30	82.5	36.4		11	82.5	13.3	
Gastrointestinal symptoms								
June	32	87.5	36.6	<0.001	27	84	32.1	0.34
July	39	87	44.8		15	81	18.5	
August	16	82	19.5		28	77.5	36.1	
September	11	84	13.1		15	81	18.5	

*Incidence rates given in episodes of symptoms per 100 person-months of exposure

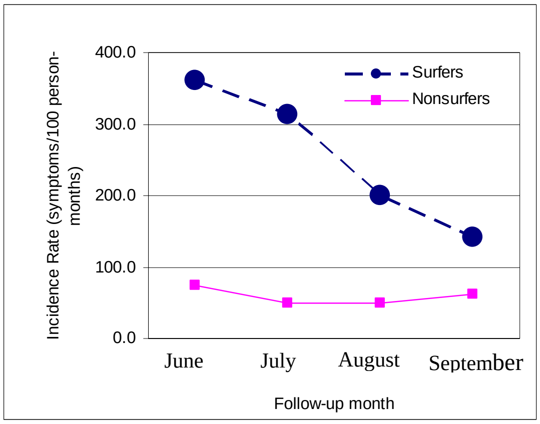

Figure 1 Respiratory Symptoms

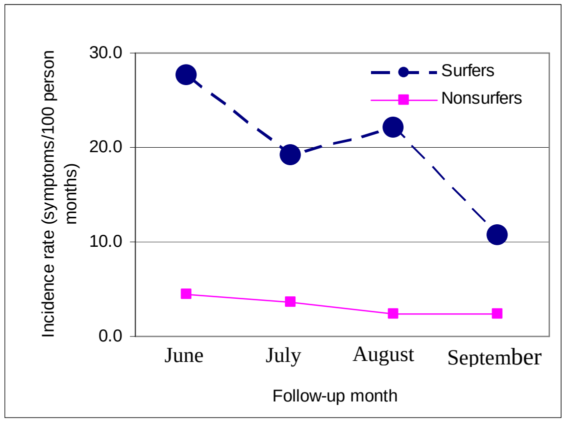

Figure 2 Eye and ear infections

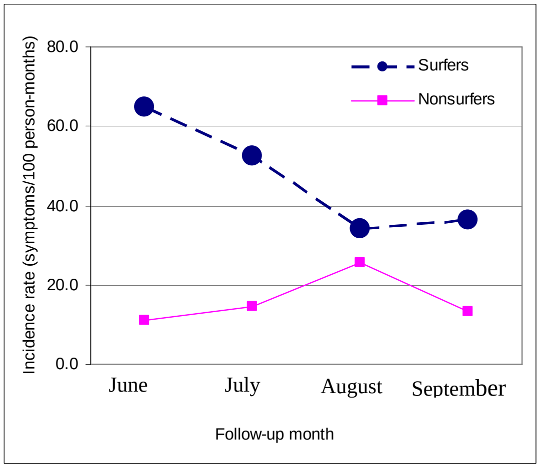

Figure 3 Skin Symptoms

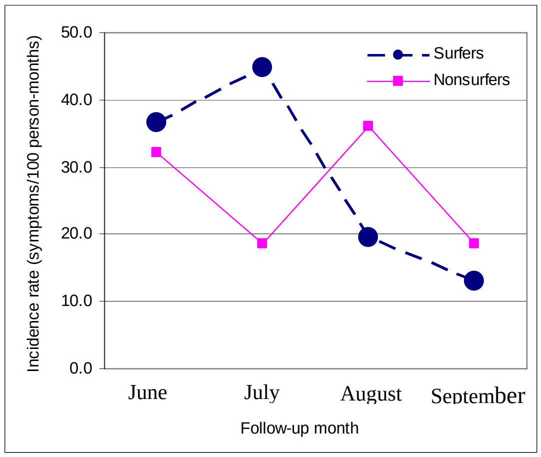

Figure 4 Gastrointestinal Symptoms

Figures 1-4 Seasonal patterns of respiratory symptoms, eye and ear infections, skin symptoms, and gastrointestinal symptoms among surfers and nonsurfers

Table 5 Multivariate Poisson Regression analyses on the difference in incidence of symptoms between surfers and non-surfers, Oregon Windsurfer and Kiteboarder Health Study, May–September, 2008

Symptoms	Surfers			Non-Surfers			RR [a]	95% CI [b]
	No. of episodes	Total person months	Incidence rate*	No. of episodes	Total person months	Incidence rate*		
Respiratory symptoms	702	285	246.3	180	307	58.6	3.9	3.3–4.7
Eye and ear infections	68	349	19.5	11	342	3.2	7.2	3.7–14.3
Skin symptoms	156	337	46.3	54	337	16.0	2.4	1.7–3.4
Gastrointestinal symptoms	98	347	28.2	85	325	26.2	1.1	0.8–1.6

*Incidence rates given in episodes of symptoms per 100 person-months of exposure
[a] RR=Rate ratio; [b] CI=Confidence Interval; If 95% CI includes 1.0, then the RR is statistically significant.

Table 6 Multivariate Poisson Regression analyses on the difference in incidence of symptoms after last outing of surfing between surfing on the Columbia River Gorge and in other places, Oregon Windsurfer and Kiteboarder Health Study, May–September, 2008

Symptoms	Columbia River Gorge			Other places			RR [a]	95% CI [b]
	No. of episodes	Total surfing hours	Incidence rate*	No. of episodes	Total surfing hours	Incidence rate*		
Respiratory symptoms	102	748.2	13.6	5	93	5.4	2.7	1.0–7.3
Eye and ear infections	9	748.2	1.2	2	93	2.2	0.4	0.1–1.8
Skin symptoms	26	748.2	3.5	1	93	1.1	2.9	0.4–21.2
Gastrointestinal symptoms	11	748.2	1.5	1	93	1.1	1.2	0.2–9.7

* Incidence rates given in episodes of symptoms per 100 surfing hours
[a] RR=Rate ratio; [b] CI=Confidence Interval; If 95% CI includes 1.0, then the RR is statistically significant.