

Visitor Perceptions of Air Quality at Indoor Swimming Pools

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Introduction

Visitors to indoor swimming pools are exposed to pool air each time they are on the premises. The potential negative effects of pool air have been researched from an occupational perspective, but little has been done to look at effects of short term exposure on visitors.

To investigate this issue from a public health perspective, a questionnaire was created and distributed to visitors at indoor pool facilities. Visitors were surveyed about their perception of pool air quality, temperature, humidity, and chlorine and mold odor at the facility, as well as any health effects that they had experienced while at the pool.

Methods

- Participants were recruited at indoor swimming pool facilities and given an anonymous survey
- Eligible participants were over the age of 18 and were able to ask any clarifying questions
- 6 pool facilities in the Toronto area were used for the study
- Age of facility and a description of the viewing area were noted
- The survey included questions regarding: demographics, overall air quality, temperature, humidity, chlorine and mold odor, and common ocular and respiratory symptoms
- Air quality, temperature, humidity and odor were rated on a Linkert scale for both the day of the visit and at perceived worst
- Relative humidity, temperature, combined chlorine and mold counts were measured at the same time as the survey and comparative analysis was used to investigate the perceived air quality versus the actual measures
- Health effects were counted and correlated with the number of hours spent per week at the pool

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Results

Table 1: Site information and readings

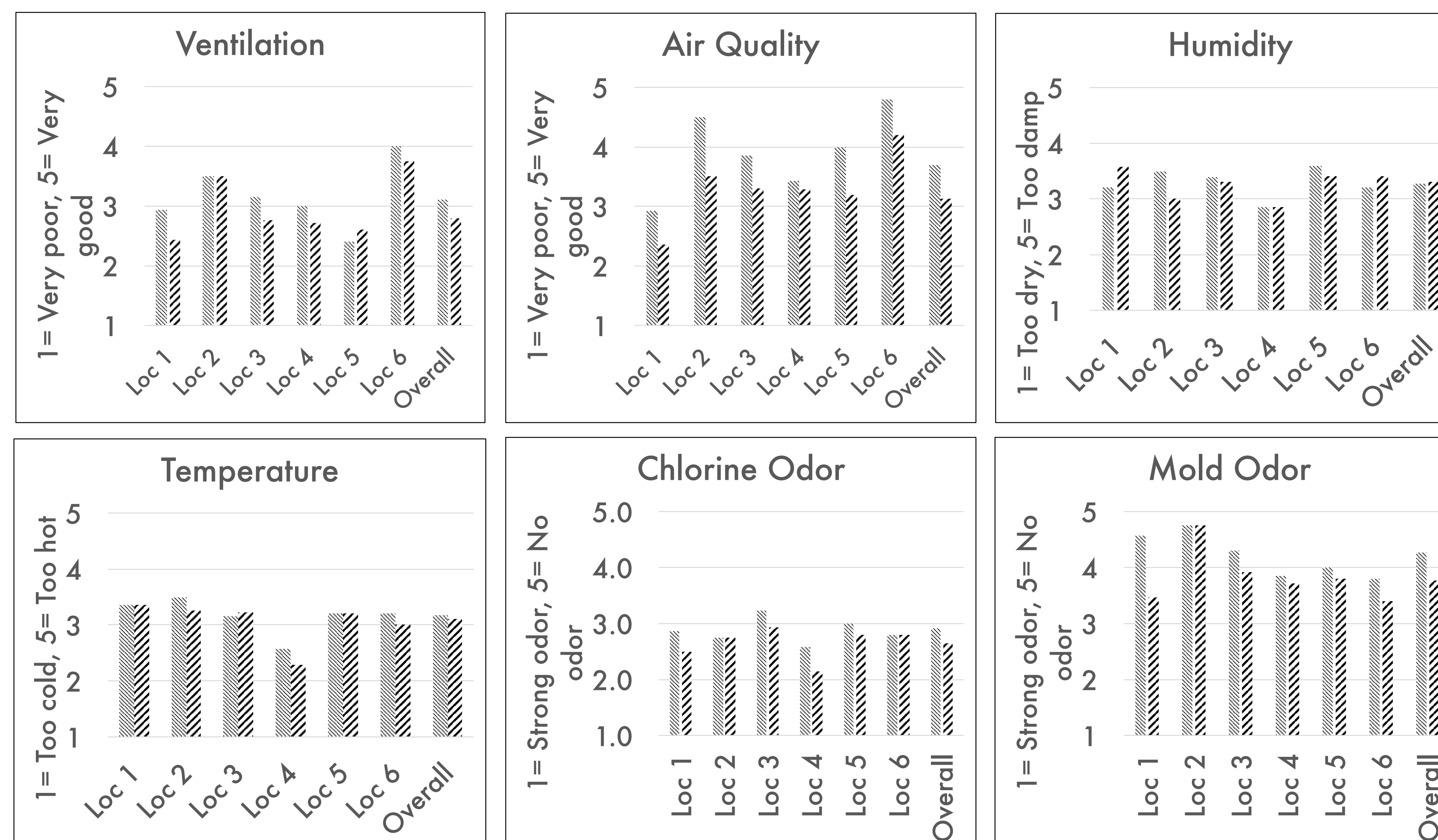
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Opening year	2003	2013	2014	1983	1972	1972
Mean Temperature (°C) [Range]	25.2 [17.4 - 25.6]	27.9 [25.5 - 28.9]	25.1 [19.1 - 25.7]	24.6 [21.9 - 24.8]	26.9 [24.2 - 28.5]	25.6 [21.5 - 27.1]
Mean RH (%) [Range]	56.4 [52.4 - 78.9]	36.1 [31 - 47.2]	51.6 [42.7 - 84.6]	45.5 [39.3 - 55.9]	61.7 [46.9 - 64.7]	61.1 [57.5 - 83.2]
Mean water combined chlorine (ppm)	0.4	0.3	0.1	0.2	0.2	0.3
Description of viewing area	On deck	Above pool	Above pool	On deck	Above pool, glass encloses area	On deck

Table 2: Demographics (n=48)

	Respondents
Female	29 (60.4%)
Male	19 (39.6%)
Age	Respondents
18-30	7 (14.6%)
31-40	8 (16.7%)
41-50	28 (58.3%)
51+	5 (10.4%)
Hrs./ Week at pool	Respondents
<2 hours	35 (72.9%)
3+ Hours	13 (27.1%)

Table 3: Total counts of each health symptom

Ocular	
Symptom	Current
Itchy Eyes	16
Red Eyes	14
Watery Eyes	7
Respiratory	
Symptom	Current
Runny nose	13
Blocked or stuffy nose	13
Cold	8
Shortness of breath	7
Cough	7
Wheeze	5
Voice loss	3



Figures 1-6: Questionnaire results by survey question. Respondents were asked to rate each of these factors on a 1-5 scale in terms of conditions "today" and conditions "at their worst".

Discussion

Based on the results of the survey, the perception of air quality by visitors was relatively neutral in all categories. These results indicate that visitor perceptions are consistent with the readings taken at each pool. Visitors did not find any particular facility to have extremely poor air quality. Ratings of chlorine and mold odor were also consistent with the relatively low readings taken at the facilities.

"Itchy eyes" was the most commonly reported symptom by respondents, with 16 indicating that they were experiencing this symptom at the facility. Red eyes and watery eyes were also highly reported. In terms of respiratory symptoms: blocked or stuffy nose, runny nose, and cold were the highest reported. Respondents were asked if they had any known allergies or medical conditions, but only 3 of the 48 surveyed indicated that they did.

No correlations were found between the number of hours spent at the pool and the reported health symptoms.

Conclusions and Limitations

Overall, the air quality perceived by visitors appears to be satisfactory.

The biggest limitation to this study is small sample size. Other limitations include: potential recall bias, subjective nature of the rating system, and language barriers for respondents.

The variance in the type of viewing area is an interesting area to focus future studies, as this factor may have affected the air quality.

As most respondents spent less than 2 hours at the pool each week, finding respondents with higher exposure would be another area for further investigation.

Based on the number of health symptoms reported, the area of short term exposure to pool air should be studied further on a larger scale.