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Bathing water quality: public perception and awareness

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Abstract

The public awareness of, and response to, information regarding bathing water quality was evaluated along the beaches of Poole, Dorset, during the peak summer months in 2013. A questionnaire survey was conducted in the form of an informal interview with participants at the beach. 61% of the sample rated coastal pollution of high importance to them and the participants correctly identified the negative impact that sewage, agriculture, litter and fuel have on bathing water quality. Bathing water quality was the second most important factor influencing the public decision to visit a particular beach. Furthermore there was statistically significant evidence to suggest that the influence of bathing water quality decreases with increasing age. Despite the Environment Agency having the highest amount of public familiarity, the information they provide was perceived to be of lower quality than Surfers Against Sewage, the RNLI and the Blue Flag Scheme. Additionally non-watersports users were identified as rating the Environment Agency information of poor quality. Finally, recommendations that the Environment Agency could implement to increase public awareness of bathing water quality were made; develop beach signage and improve the use of social media.

Introduction

The coastal environment marks the boundary between the land and sea and is an area subject to intense pressure from natural and human sources. Anthropogenic activities which are a major contributing factor to this mounting pressure include waste disposal, transport, fishing, urban development and recreation to name a few. The North Sea is the most densely populated basin in Europe with a mean density of 250 inhabitants per km^2. Within the North Sea, the UK is one of the countries with the highest population density in coastal regions; 375 inhabitants per km^2 (Eurostat, 2009). The coast is heavily utilised for leisure activities. Coastal resorts appeal to a great number of tourists each year; 63% of European holidaymakers prefer the coast (Davenport and Davenport, 2006).

The amount of tourism, along with the coastal population density, has brought key concerns regarding the quality of the coastal environment to light (NOC, 2013) such as litter and water contamination by industrial and urban waste water.

The Urban Waste Water Treatment Directive was adopted in 1991; its primary aim was to 'protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors' (EEC, 1991a). The Directive required all member states to have collection and treatment systems in towns with a population equivalent above 2000 (EEC, 1991b). As well as showing the increasingly detailed nature of European Union legislation, this Directive also applied to both industrial and domestic sectors (Weale et al, 2000).

Across Europe, the coastal zone is used for discharging waste water from urban areas; to prevent these areas flooding during periods of intense rainfall. In the UK since the late 1990s, all urban waste water has been generally treated before being discharged directly to the coast via Combined Sewer Overflows (CSOs) (Davis & Hall, 1997). There are currently about 31,000 CSOs discharging into rivers and seas around the UK (SAS, 2013), this includes at least 500 located at the beach (Marine Conservation Society, 2011). During the 2013 bathing season there were 199 CSO used across Devon and Cornwall for a total of between 40 and 365 hours (Environment Agency, 2013).

Human health issues and increased plastic litter at the coast (Foster et al, 1971) brought about a response by the European Union in 1976 to manage the problem; this was the first Bathing Water Directive. The overall aim was to improve the bathing water quality for public health reasons (Ward et al, 1995). The legislation outlined that the microbial contamination of water was considered to be the most critical risk factor in water quality (Fawell & Miller, 1992). Enteropathogens are serious pathogens that affect humans via bathing water and require routine monitoring. Enteropathogens cause diseases such as cholera, typhoid and dysentery. However, these organisms are difficult to detect and thus an indicator species is required (Atlas & Bartha, 1993).The presence of *Escherichia coli*, commonly referred to as *E-coli*, is easily tested and it is relatively much more abundant than the harmful enteropathogens, therefore its use as an indicator of sewage contamination provides a safety margin for the detection of disease-causing organisms (Gleeson & Gray, 1997). However it only infers the presence of pathogens (Berg, 1978) and they may not all be from human sources as other warm blooded organisms also carry *E-coli* (Winfield & Groisman, 2003).

The Bathing Water Directive was revised in 2006 to meet the new demands and reflect changing times; its purpose is to preserve, protect and improve the quality of the environment and to continue to protect human health (EC, 2006). It is required that all Member States ensure that, by the end of the 2015 bathing season, all bathing waters are of at least 'sufficient quality'; less than 500 coliform colonies per 100ml. According to the 2013 annual report provided by the European Commission, the UK has a high rate of non-compliant beaches, 6% (EEA, 2013).

Article 12 of this legislation states that the Member States must ensure that the following information is made available for the public:

- The current bathing water classification
- Bathing area description
- Short-term pollution risks
- Should bathing be prohibited; notice advising the public and giving reasons
- An indication of the sources of more information such as the Internet.

The information referred to above must also be distributed to the public as soon as it is available and with effect from the start of the 2012 bathing season (EC, 2006).

In the UK, the Environment Agency is the government organisation responsible for implementing the changes set out by the 2006 Bathing Water Directive. Information sources to fulfil the requirement set out by the Directive have been made available to the public. There is a need to establish the extent to which the public are aware of this information and how they perceive it.

The aim of this paper is to determine the public awareness of, and response to, information regarding bathing water quality along the beaches of Poole, Dorset, during the peak summer months.

The steps to fulfil that aim are; an assessment of public awareness of coastal pollution; a determination of public perception of information sources; an investigation into the factors that influence the public decision making process; presentation of current legislation and suggestions for improvements by local authorities

Methods

Questionnaire Design

A questionnaire, in the form of an informal interview, was conducted to collect data about public awareness of, and response to, information regarding bathing water quality. To ensure a good return rate of the target audience (Kelley et al, 2003) (those people that went to the beach) the data collection was conducted on the beach in July and August 2013. An informal interview was best way of collecting data in the coastal environment because it enabled the researcher to record open and closed questions, in addition to answering Likert score questions (Foddy and Foddy, 1994).

The length of the interview has to be a compromise between gaining as much data as possible and maintaining the interviewee's concentration (Regula-Herzog and Bachman, 1981) which may be difficult on the beach with friends and family. For this reason the survey was designed to last only 5-10 minutes. Likert scale questions,

which involve the participant scoring variables of the interviewer's choosing, were incorporated into the questionnaire to provide responses which could be quantified in subsequent data analysis (IBM, 2012).

After detailing the questions that were required to be asked, the questionnaire was formatted to fit onto a double-sided A4 page. As well as fulfilling the time requirement of 5-10 minutes, this layout also enabled the interviewer to complete the document quickly and with little distraction from the face-to-face interview. A simple layout of tick boxes and numbers to circle were included to aid with the completion process.

One of the potential issues associated with questionnaires, in any form, is that they can bias the responses of the participants (Oppenheim, 2000). The manner in which the questions in this research were asked did not guide or sway the interviewee's response. No answer options were provided to the participant directly after the question had been asked. This therefore meant they were thinking independently about the question and initially nothing the interviewer had said was influencing them. In cases where the participant could not volunteer an answer, the researcher prompted them and these responses were recorded separately as to distinguish between 'volunteered' and 'prompted' answers.

The questionnaires were initially piloted on a small focus group. The main aim of this task was to receive feedback about two aspects of the data collection. Firstly, the phrasing and terminology used during the questionnaire was critiqued. This is important because the scientific community often uses language in a way that the general public are not familiar with (NSF, 2004). Care had been taken when preparing the survey and such no negative comments were made during the pilot scheme. The interviewing style was also discussed after the pilot session. There would only be one interviewer throughout the entire data collection process. This limited the number of responses that could be obtained in the set time frame but the benefit was that every interview was consistently conducted in the same manner. The flow of the interview was improved from the feedback received during this exercise.

In order for there to be sufficient data to analyse, a target of conducting at least 100 individual interviews in the peak summer months of July and August was set; 125 interviews were eventually conducted. Selection of participants was based on trying to achieve a broad spread of data based on gender, age and whether they were a tourist or a local. A broad spread of participants would help to give a more accurate overall picture of the population.

The data were collected on the beaches of Poole, England. Figure 1, shows the area relative to the south of England and also the exact locations of data collection. Table 1 shows a key to the map:

Table 1: Key to map, Figure 1.

Symbol	Location
A	Branksome Chine
B	Canford Cliffs Chine
C	Shore Road
D	Sandbanks

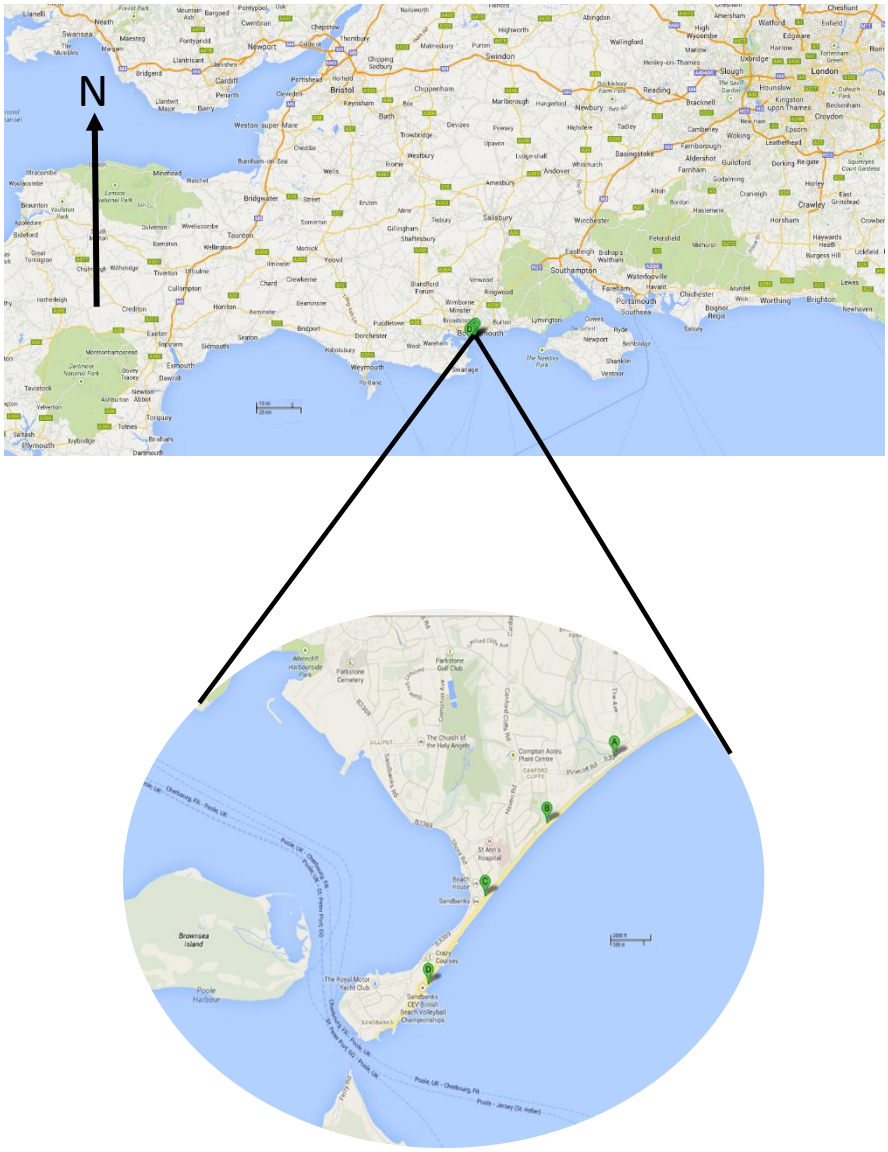

Figure 1: Location of Poole in relation to the south of England (top). Location of 4 beaches within the Poole borough (bottom).

Analytical Technique

When analysing the data, the participants were categorised into target groups based on age, gender, tourist or local. There were seven age categories ranging from 18-75+. The tourist category was split into two sub-groups; inland and coastal. An inland tourist was an individual who was visiting the area but whose permanent residence was inland. A coastal tourist was an individual who was visiting the area and whose permanent residence was on the coast in a different region. The local category was divided into 3 sub-groups based on how frequently the individual visited the coastal environment. The sub-groups were 1-2 times a week, 2-4 times a week and 5-7 times a week.

The main focus of the analysis was on uncovering relationships between two variables. For example, comparing the age of a participant to how they rated coastal pollution. In this example, the age and rating are the two variables for which a relationship could exist. In order to compare these two variables, a cross tabulation was set-up to show the joint frequency distribution (IBM, 2012). After a relationship had been established the significance of the result needed to be investigated. The chi-square test was used for assessing the statistical significance of the relationship between the two variables. Critical values of the chi-square score were used to reject or accept the null hypothesis for a particular relationship and to evaluate the level to which the relationship was significant.

To ascertain the strength of relationship a lambda value was used. Lambda can measure the strength between a nominal and an ordinal variable or between two nominal variables. Lambda can underestimate the strength of relationships (IBM, 2012), although this can potentially lead to some relationships being overlooked, it means that there is more faith in the relationships that lambda does show to have moderate-very strong strength (POLS, 2009). Another benefit of lambda is that it is a Proportion Reduction in Error (PRE) measure. PRE is the improvement in predicting a dependant variable due to knowledge of the independent variable (Costner, 1965). Lambda ranges from 0-1, with the corresponding qualitative meaning for the quantitative ranges shown in Table 2.

Table 2: Translation of quantitative value into qualitative meaning (IBM, 2012).

Quantitative Value	Qualitative Strength of Relationship
0-0.1	None
0.1-0.2	Very weak
0.2-0.3	Moderate
0.3-0.4	Moderate-Strong
0.4+	Very Strong

Results

The results obtained from the questionnaire interview is presented and described. Firstly, a brief description of the sample is given, followed by results about the awareness of the public to the issue of bathing water quality. Leading on from this,

the sample's opinion on the various organisations that provide water quality information is presented alongside the factors that influence their decision-making process. Finally, the public response to water quality failure of a bathing area is shown.

Sample Description

The sample comprises of 125 interviewees with a range of characteristics. There were 90 locals the majority were between the ages of 25 and 55 years old (Figure 2). There was a 55/45 split in gender with more females in the sample than males.

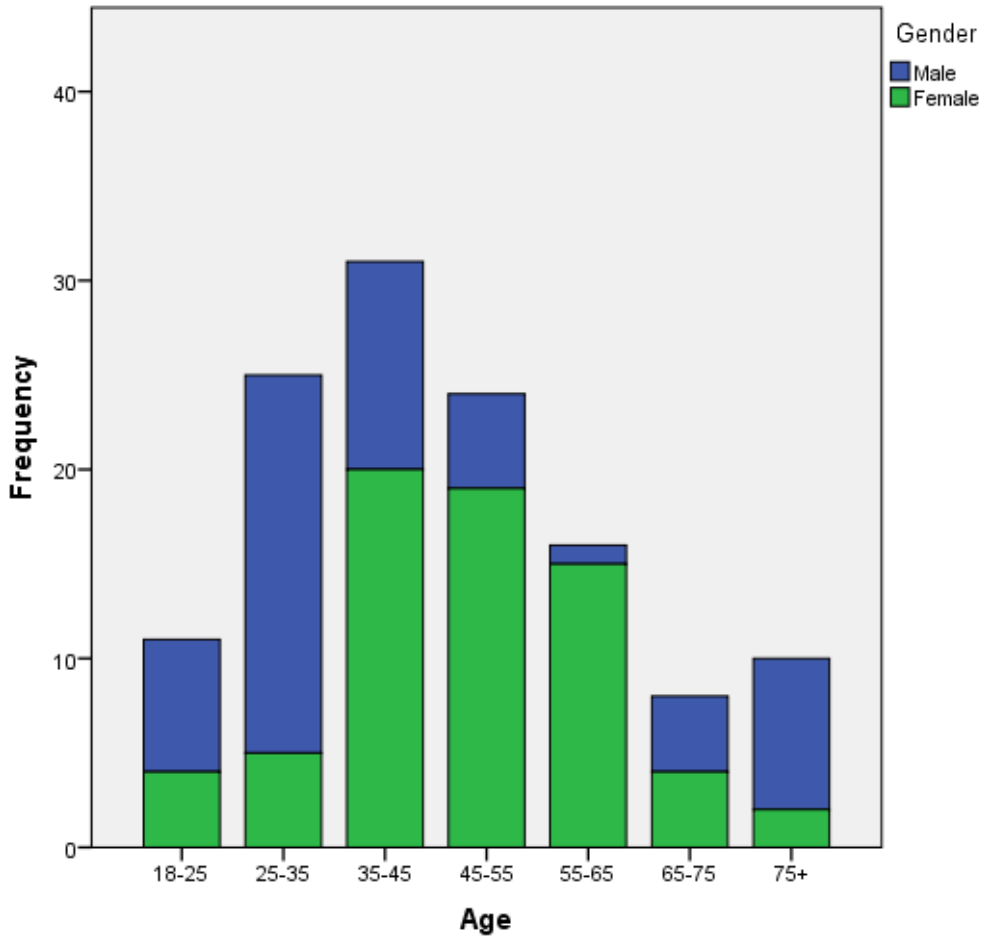

Figure 2: Frequency histogram showing age and gender distribution in the sample. N=125.

As shown in Figure 2, 65% of the sample was between 25-55 years old. Within this age range the largest age category is the 35-45 year olds.

Public Awareness

To determine public awareness of coastal pollution the following question was asked: 'How important is coastal pollution to you?' There were three options available to choose from, 'low', 'medium' or 'high' importance. The sample response is shown in Figure 3.

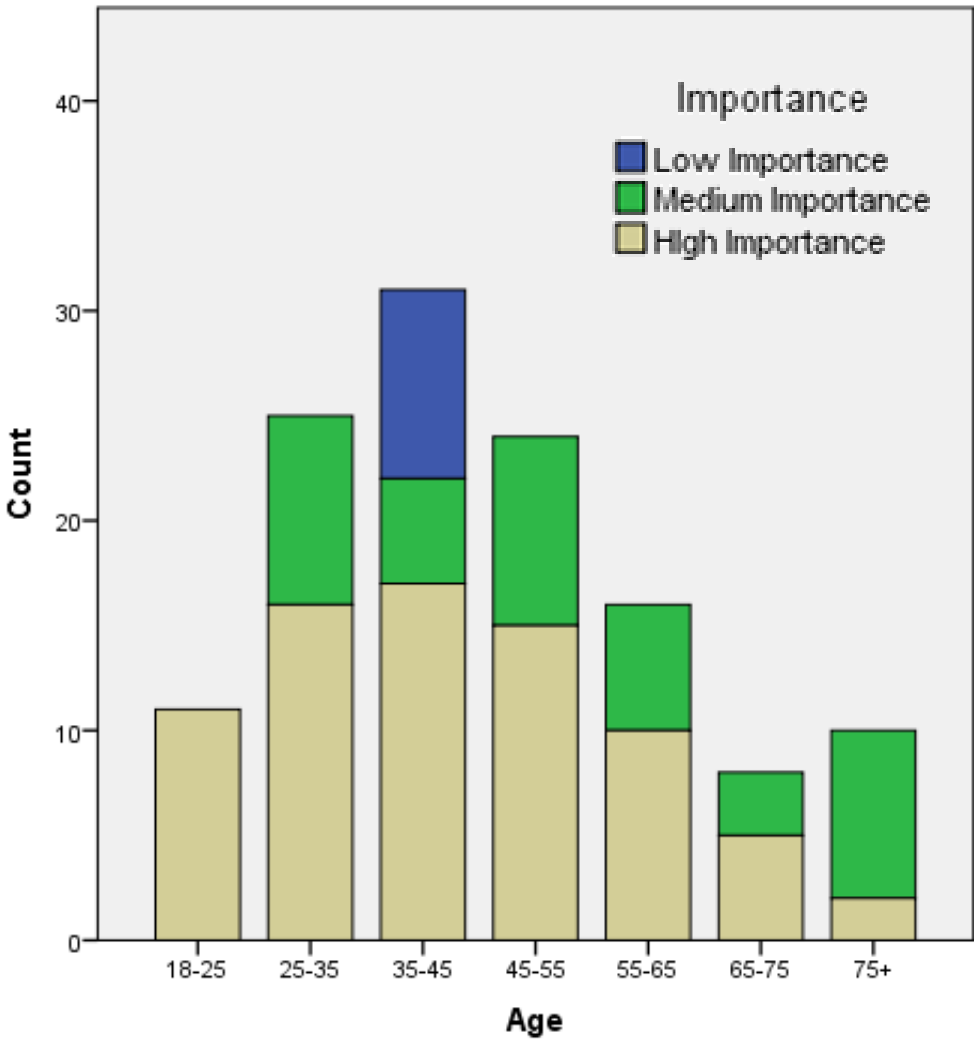

Figure 3*:* Importance of coastal pollution with respect to age. N=125.

The majority of the sample, 61%, rated coastal pollution as being of high importance to them, while the 9 people (7%) who rated coastal pollution as of low importance were aged 35-45 years old (Figure 3). The only age group to unanimously rate coastal pollution of high importance was the 18-25 years old.

To assess the public awareness to coastal pollution the following question was asked, 'What effect do the following factors have on bathing water quality?' The interviewee was asked to score twelve factors and their relative effect on a 1-5 scale. 1 for improves, 3 for no effect, 5 for worsens the quality of the water in the bathing area, Table 3.

Table 3: The average scores for each factor which may affect water quality on a scale from 1, improves water quality, 3, has no effect on water quality, to 5, worsens water quality. The factors are sorted by descending mean. SD is the Standard Deviation. The range of answers given for each factor is shown in the far right column. N=125.

Factor	Mean	SD	Range of answers
Sewage	4.84	0.37	1
Litter	4.46	0.73	3
Motors	4.45	0.66	2
Agriculture	4.13	0.82	3
Bathers	3.83	0.84	4
Seaweed	3.26	0.98	4
Water Colour	3.10	0.92	4
Weather Yesterday	3.07	0.81	4
Rain	2.94	0.98	4
Wind	2.94	0.83	3
Weather	2.79	0.97	4
Sunlight	2.14	0.95	3

The public correctly identified sewage, litter, fuel and agriculture as likely to have a significant negative effect on water quality with average scores for each of over 4 (Table 3). Sewage was acknowledged to have the most negative impact, not only does this factor have the highest mean score, 4.84, it also has the lowest standard deviation and a range of only 1 indicating that every participant scored sewage either a 4 or a 5.

On the other side of the coin, sunlight is perceived to have the highest positive impact on bathing water quality, with a mean of 2.14, this equates to a qualitative response of ‘moderately improving’ water quality. This demonstrates that the participants can correctly identify the impact of several factors that have a positive and negative effect on water quality. However, the sample perceived the meteorological conditions to have no effect on the water quality and could not distinguish between them; the weather yesterday, weather today, rainfall and wind.

Public Perception of Information

It is important for organisations that provide information to the general public to assess the quality of their information given. The public opinion about this information is the most important opinion, this section will detail the responses given by this specific sample to three characteristics of the information provided by various organisations. The three characteristics the participants were asked to score were: ‘relevance to this beach’, ‘accuracy and reliability’ and finally ‘up-to-date nature’ of the information. Information provided by nine different organisations was scored on a scale of 1-5; where 1 is low, 3 is medium and 5 high quality. The outcome of the responses is given in Table 4.

Table 4: Ranking of organisations, that provide bathing water quality information to the public, based on three characteristics of this information. Ranking for the individual characteristics is shown in Column 1. The organisations shown in Column 2 are ordered by descending mean when the score for all three characteristics is combined. The number of individuals using each organisation for information gathering is shown in column 3.

Rank in order of how useful the sample found the information			Organisation	Number of individuals selecting organisation as a source of info
Relevance	Accuracy/ Reliability	Up-to-date		
2	1	1	Surfers Against Sewage	53
3	3	2	RNLI	93
1	2	3	Blue Flag Scheme	95
4	4	4	Environment Agency	105
5	5	5	Council	74
6	6	6	Other	4
7	7	7	Wessex Water	43
8	8	8	Beachfront Businesses	47
9	9	9	Travel Agencies	37

Surfers Against Sewage (SAS) are perceived by the sample to have the best quality information overall, including the best for accuracy/reliability and up-to-date nature, Table 4. The ranking system was based on the mean value obtained from all interviews where the participant used the organisation for information gathering, in a situation where the interviewee was not familiar with a particular organisation a score

of 0 was given, all 0 values were omitted when the mean scores for each organisation were calculated.

Only 53 participants (44%) were familiar with SAS for information gathering, whereas 93-105 participants (75-85%) were familiar with the RNLI, the Blue Flag Scheme and the Environment Agency. Even though the Environment Agency (EA) had the highest amount of familiarity within the sample, this organisation ranked 4th out of all the organisations that supply bathing water quality information to the public. The EA are the government department responsible for providing information to the public about bathing water quality, further analysis of this information was conducted and will be reported in a later section.

The category 'Other', Table 4, was an option for participants to rank any other sources of information that they used for gathering information about bathing water quality. Of the total 125 participants, only 4 indicated that they used an additional source. All of these participants used the local newspaper as a source of information. This source ranked 6th overall, Table 4, with a mean score of 3.5 out of 5, representing a medium quality source.

Influencing Factors on Public Decision

Not only it is important to assess the awareness and perception of a sample to information it is imperative to understand how that information influences the decisions made. Included in the questionnaire was a question directly relating to this topic: 'When choosing a beach to visit, how influential are the following factors in that decision?' The participants were asked to score 7 influencing factors on a likert scale of 1, not at all important, 3, a consideration, to 5, very important factor. The influencing factors are categorised as either physical parameters (wave, tide, wind) or beach characteristics (access, facilities, number of bathers). The scores for bathing water quality are shown as a separate category for comparison, Figure 4.

The sample's main priority when deciding a beach to visit was access (mean of 3.7). Bathing water quality follows this being the second most influencing factor, wind conditions completes the top three influencing factors. Wave conditions was the least influencing factor, a mean of 3.0 indicate the participants view wave conditions as 'a consideration' when deciding a beach to visit.

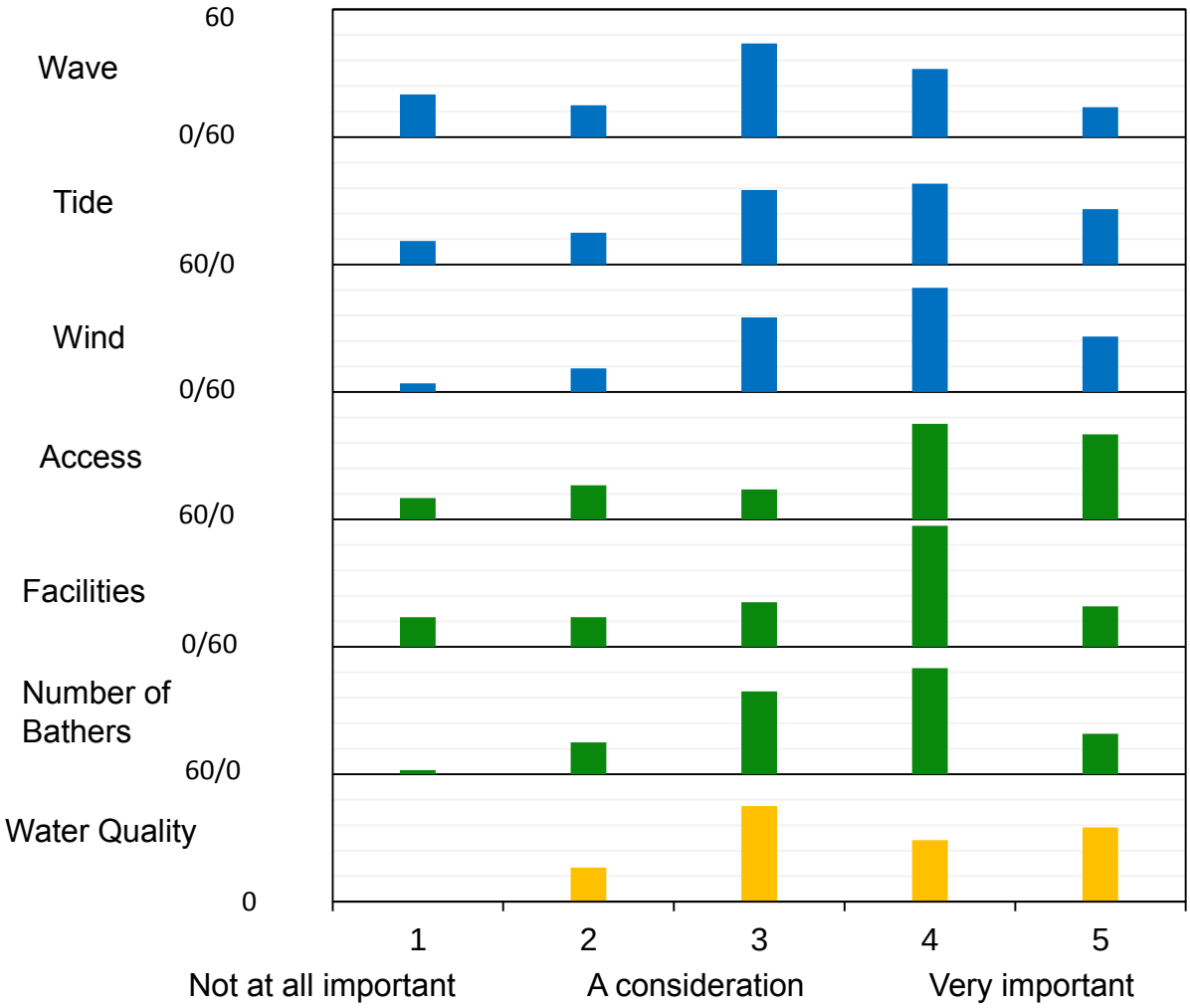

Figure 4: Distribution of answers in response to the question: When choosing a beach to visit how influential are the following factors in that decision? The physical parameters are shown in blue, the beach characteristics in green and Bathing Water Quality in yellow. The subplot for each influencing factor has a scale of 0-60 participants. N=125.

Public Response to Bathing Water Quality Failure

As part of the 2006 Bathing Water Directive there is a requirement for government agencies to provide relevant information to the public should bathing be prohibited or if the water quality standard of a beach was to be downgraded.

In order to ascertain the reaction and response of the participants to the possibility of a beach failing the minimum water quality standard the following question was asked; 'If a beach you were planning to visit was to fail the bathing water standard would you still go there?' This was a closed answer question with the option of 'Yes' or 'No' available.

100% of participants who regarded coastal pollution of low importance to them would still visit the bathing area even if it failed the minimum quality standard, Figure 5.

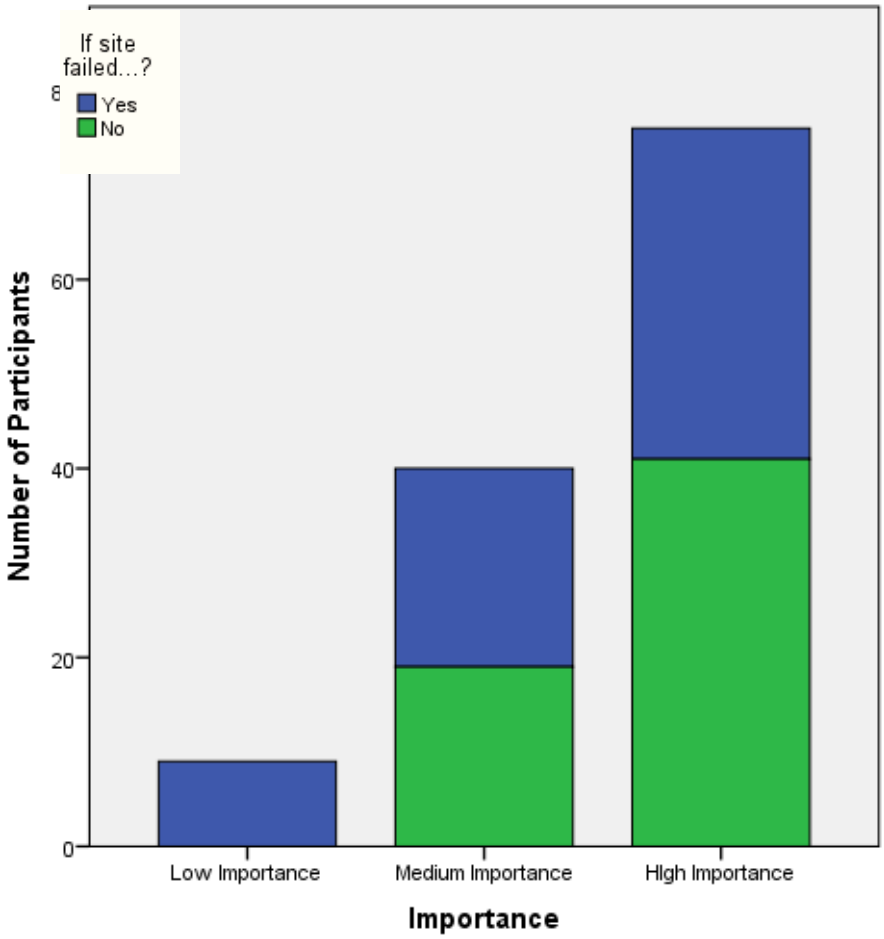

Figure 5: The number of participants who would still visit a bathing area even if it failed to meet the minimum water quality standard, yes (blue) or no (green) against the participant's respective rating of the importance of coastal pollution to them. N=125.

Opinion is divided among those participants who rate coastal pollution of medium and high importance to them as to whether or not they would still visit a bathing area if it failed the minimum standard of water quality, Figure 5. However, the 9 individuals who rate coastal pollution of low importance would continue to visit a bathing area that had failed water quality guidelines.

The type of activities that the participants partake in could impact upon their response to a bathing area failing a water quality test. To investigate this, a null hypothesis was put forward; participants who visit the beach to 'Just View' the scenery will not visit the beach if it fails to meet the minimum water quality standard. Based on the chi-square score, 8.705, the null hypothesis can be rejected and a relationship is shown to exist. To test the strength of this relationship a lambda value was derived; 0.258. This lambda represents a 'moderately strong' relationship. In this scenario, the chi-square score and lambda value mean that the relationship is significant at the 0.01 level and that by knowing if a participant is visiting the beach to 'Just View' the scenery there can be an improvement in the prediction of whether they will visit the beach even if it fails the minimum water quality standard of 25.8%.

Discussion

The results section has provided a description of the responses given by a sample of 125 people in Poole, Dorset, regarding their awareness of bathing water quality and perception of information. This section will discuss the trends and relationships that can be drawn from the responses to the questionnaire, the implications of the results for the organisation who provide information regarding bathing water quality and improvements that could be made to ensure the legislative guidelines laid out by the revised Bathing Water Directive are met to the highest standard.

Target Groups

Public Activities

Understanding the type of activity that the public are involved in is vital in evaluating their use of bathing water quality information. The relationship between whether or not the participant was involved in watersports and factors which influence their decision to visit a beach is described in Table 5.

Table 5: Relationship of answers given by watersports users (n=55) and various factors influencing their decision to visit that particular beach. The chi-square score, level of significance and lambda value are shown for each factor. The lambda score shows the strength of the relationship that exists between a specific influencing factor and watersports users.

Watersports/Influencing Factor	Chi-square score	Level of Significance	Lambda value
Wind	33.248	0.01	0.327
Wave	53.79	0.01	0.582
Bathing Water Quality	12.82	0.05	0.2
Tide	39.176	0.01	0.473
Number of Bathers	0.727	0.95	0
Facilities	22.73	0.01	0.345
Access	25.307	0.01	0.364

The most statistically significant influencing factor to watersports users on the beaches of Poole is wave conditions. This relationship is significant down to a level of 0.01 and the lambda value is the 0.582, indicating that a very strong relationship exists.

No relationship exists between watersports users and the ‘Number of Bathers’ as an influencing factor, however, the penultimate least significant relationship between watersports user and influencing factors was with ‘ Bathing Water Quality’; only a borderline very weak/moderately strong relationship exists.

The public perception of bathing water quality, and the trend shown previously, is not as dependant on watersports involvement as the influence of physical parameters (wind, wave, tide) are on deciding a beach to visit.

Age Group

The influence of bathing water quality on the public when deciding a beach to visit is dependent upon the age of the member of public. The influence of bathing water quality on the public is reduced within older age categories, Table 6.

Table 6: The percentage of each age category for whom Bathing Water Quality was either an important or very important factor.

Age	Percentage either important or very important (%)
18-25	64
25-35	50
35-45	55
45-55	60
55-65	43
65-75	25
75+	20

For participants aged 18-55 years old the percentage of the age groups for whom bathing water quality had either an important or very important influence ranged from 50-60%. For participants aged 55-75+ years old, the range was less; 20-43%. A Pearson product-moment correlation coefficient describes the relationship of these data, R^2 equals 0.773. This proves that a relationship exists between the age group and influence of bathing water quality. For this relationship to be statically significant it must be above the critical R^2 value for a sample with 5 degrees of freedom, at a level of significance of 0.05. This critical value is 0.7545, this provides sufficient evidence for the statement; the influence of bathing water quality on the public decision making process of deciding a beach to visit decreases with increasing age.

For organisations who provide bathing water quality information to the public it is important to understand that there are multiple target groups with varying perceptions and a differing level of awareness of bathing water quality.

Information Sources

The results showing public perception of information provided by various organisations were most surprising. The Environment Agency ranked 4th out of 9 organisation, based on the accuracy and reliability, relevance to the specific beach and up-to-date nature of the information they provide regarding bathing water quality (Table 4). In the UK, the Environment Agency (EA) is the competent authority responsible for implementing the changes set out by the 2006 Bathing Water Directive and reporting to the EU. This organisation was not ranked as highly as expected. The EA was the most used information source, with over 80% of the public utilising the provided information. However, Surfers Against Sewage (SAS), the RNLI

and the Blue Flag Scheme all ranked higher than the EA for overall quality of information.

As previously noted under the new directive the EA have to ensure that the following information is made available to the public:

- Current bathing water status
- Prediction of poor water quality and short-term changes in water status, with relevant public advice

They have produced sufficient measures to portray this information to the public. There is a Bathing Water Explorer which contains a very detailed analysis of every bathing area and covers all the above bullet points. The main problem to overcome is making the public aware of this information.

In this study, 20 participants were not familiar with the EA for providing information regarding bathing water quality. Of those, 95% were not involved in watersports. In addition, there were five participants who perceived the information to be of low quality; all of these people were not involved in watersports. From this it can be stated that people who do not take a proactive interest in using the marine environment for business or recreation are either not aware of, or poorly rate, the information provided by the EA regarding bathing water quality.

With respect to the other organisations, the RNLI's main role at the beach is water safety, SAS's main aim is to protect the oceans, waves and beaches through campaigns, education and research. Both these organisation were ranked above the EA. The people who are interested in these two organisation also have a keen interest in using the water either for business or recreation. Of the 36 people who rated the SAS information high quality (score of 4 or 5), 70% were involved in watersports.

The interest of these participants guides and informs them about the marine environment to a greater extent than those people who are not as interested in benefitting from the marine environment.

This study is not revealing that the information provided by the EA is of low quality, but that for the EA to improve the awareness of the public they should target those who are not involved in watersports. Some possible mechanism for achieving this are now presented.

Recommendations to Improve Public Awareness

The two main areas that the EA could potentially target to improve the awareness of non-watersports users are beach signage and social media. Beach signage is important regardless of whether people are involved watersports or not. In this study, 75% of the participants who were not involved in watersports still visit the beach to go for a walk. Secondly, social media has become a medium for the majority of the publics' information independent of location or interests.

Beach Signage

The information displayed on beach signage is almost entirely comprised of data (Figure 6). The only individuals who can understand this information are either scientifically minded or particularly interested in bathing quality. These target groups should not be the primary focus for the EA. To increase the awareness of non-

watersports users the information needs to be more interactive. By involving children, and in turn family members, a wider audience could be reached. Figure 6 shows the signs on a specific beach in Poole, Shore Road (point C on Figure 1). The space designated to bathing water quality is shown in the red circle, this is expanded to the right.

Figure 6: Beach signage at Shore Road, Poole. The area designated for information regarding bathing water quality is shown in the red circle and expanded to the right of the main image (Shepherd, 2012).

There is insufficient space given over to bathing water quality information. Increasing this space and increasing the interactive nature of the information could in turn increase awareness of those who do not proactively partake in watersports.

This issue highlighted here is a possible topic for future research, the details regarding the implementation of such a proposal are not discussed in this work.

Social Media

The EA already uses social media to provide the public with details of its current projects and recent work. However, there is a lack of regularity of posts with

information relating to bathing water quality. To improve the awareness of the public the nature of the information provided could be split with respect to the bathing season.

Outside of the bathing season, so from September to the following May, the focus should be on education. For example, informing people how rainfall events and urban run-off affect water quality. It was shown in this study that the public were unable to distinguish between the effects of rainfall, the current weather, previous weather and the wind. If this information was provided in partnership with Non-Governmental Organisations (NGOs) then it would be available to a wider audience. Although an over-reliance on utilising the NGOs popularity could result in the predictive role of the EA becoming non-existent.

During the bathing season, there should be weekly summaries of bathing water quality across the UK. The latest data could be presented to the public in a manner that is easily understandable and so that they can relate the out-of-season education to the impacts during the bathing season. If an organisation that the public already perceive to deliver high quality information were involved in this scheme, for example the RNLI, then the EA could improve its public image at the same time as improving the public awareness of bathing water quality.

Figure 7 shows the percentage of each age group that used the internet to gather bathing water quality information. These data can be used to counter the argument that social media does not reach all age groups.

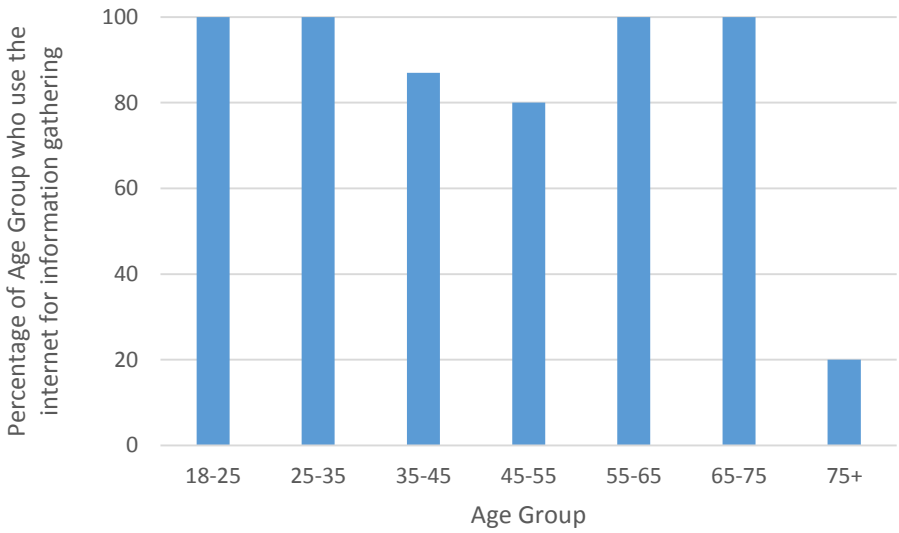

Figure 7: Percentage of each age group that use the internet to gather bathing water quality information

Besides the 75+ age group, at least 80% of each age category used the internet for gathering information regarding bathing water quality. A project launched by the Environment Agency into improving social media could reach all age groups independent of location or interest. This is the most effective way of increasing the awareness of non-watersports users about the topic of bathing water quality.

Conclusion

A questionnaire was conducted on the beaches of Poole, Dorset, in July and August 2013 to investigate bathing water quality, public awareness and perception. The public correctly identified sewage, litter, fuel and agriculture as likely to have a significant negative effect on water quality. However, they perceived the meteorological conditions to have no effect on the water quality and could not distinguish between them; the weather yesterday, weather today, rainfall and wind.

This study also revealed that the public do not rate the quality of information provided by the Environment Agency as highly as that of Surfers Against Sewage, the RNLI and the Blue Flag Scheme. This is of serious consequence because the Environment Agency are the competent authority responsible for implementing the changes set out by the 2006 Bathing Water Directive and reporting to the EU. Non-watersports users rated the information provided by the EA to be of poor quality. In order to address the issue, recommendations were made to improve beach signage and more importantly the use of social media in increasing public awareness. However, it must be noted that relying too heavily on the popularity of NGOS could result in the prediction capabilities of the EA being limited.

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