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Impact of Perceptions of Air Pollution and Noise on Subjective Well-Being and Health

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Abstract: With a growing interest in the study of urban life and health, evidence indicates that the quality of the environment in which we live can have implications for our subjective well-being and health. This study assesses the potential impacts of perceptions of visual air pollution, olfactory air pollution, and noise pollution on self-perceived health, self-perceived happiness, and satisfaction with life, through the calculation of ordinal logistic regressions, using the information of an online survey carried out in Quito, Ecuador. We found that perceptions of unpleasant odors and noise pollution influence self-perceived health, self-perceived happiness, and satisfaction with life. The obtained results may support the incorporation of citizens' perspectives to better understand environmental pollution and to enrich local planning for urban sustainability.

Keywords: odor; noise; pollution; perceptions; well-being; health

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1. Introduction

Mental disorders materialize their effects on people's quality of life reducing their opportunities (e.g., obtaining a job or maintaining a normal life) [1], and reducing levels of happiness and satisfaction with life. A lack of economic support, absence of specialized personnel in health units, and little or no investment in prevention are some of the conditions that make the world a hostile place for people with mental health issues. Worldwide, mental disorders constitute the second cause of disability [2]. This situation is aggravated in developing countries, where investment in health promotion is limited. An important percentage of disability-adjusted life years at the national level corresponding to noncommunicable diseases, is related to mental and neurological issues [2,3].

Mental disorders influenced by pollution can disrupt human well-being and quality of life. Well-being and quality of life are multidimensional concepts. However, these concepts can be interpreted in terms of health, satisfaction, and happiness [4]. Works in environmental epidemiology show evidence that cities act as triggers for the aggravation of health issues [5–7]. In the field of urban studies, research indicates that there is a strong relationship between the environmental conditions of cities and the possible improvement or deterioration in the health conditions of urban inhabitants [8–10]. Additionally, areas with a large number of inhabitants per square meter, usually correspond to areas or neighborhoods with limited resources [6].

Whether through manifestations in physical or mental health, variables such as green areas, security, provision of health services, air quality, and poverty levels are closely linked to urban human well-being [11–13]. For instance, areas with a greater presence of industries or high-traffic highways show worse results in quality of life indices [14]. Even when the pollution effects on well-being and health are of high concern, the quantification of these effects considering subjective measures is still a challenge and a priority to better understand psychophysical evaluations of urban pollution [15]. Furthermore, the empirical

research on this topic in Latin America is very limited [16]. The present investigation is an exploratory study that contributes to partially closing this research gap.

1.1. Air Pollution and Human Well-Being

Considered one of the great killers of our time, air pollution is associated with around 8.79 million deaths a year worldwide [17]. There is a growing concern about the effects of polluted air on human health since exposure is no longer confined to the home (burning wood/coal for cooking and heating) but extends throughout the environment, especially in cities, where large amounts of the population are concentrated, and, therefore, the number of vehicles and industries, and the amount of waste increase [7], turning cities into places with a high concentration of pollutants [18]. Other factors such as temperature and population density also aggravate the quality of urban life [19]. Some of the most palpable effects of air pollution can be seen in difficulties in the respiratory system, heart, and even in the brain [20,21]. These last effects have implications for our mental health due to inflammatory reactions in the brain [22]. Experiments in mice show how exposure to fine particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide (CO), and photochemical oxidants produces neurological responses similar to those in episodes of depression and anxiety [23]. All the pollutants mentioned are present in urban environments originating from different sources such as vehicles, dust, ashes, or soot [24]. Studies have found significant relationships between higher levels of environmental pollution and an increase in the number of visits to hospital emergency services due to suicide attempts [25,26].

The particulates of air pollution could cause neuroinflammation [27] and are linked to structural brain changes [28], which may be associated with illnesses such as depression, anxiety, and stress [29]. One of the mechanisms through which air pollution affects mental health and well-being is the alteration in cytokine production that changes the neural connections of mood [30]. Furthermore, in recent times mental health has been markedly affected by pollution in the context of the pandemic and climate change [31]. Recent research has found associations that indicate that exposure to pollutants could not only produce a higher incidence of mental illness but also generate dependence on antidepressants and benzodiazepines [32]. This dependency has long-term implications as it perpetuates the cycle of a poor quality of life among people.

1.2. Noise and Human Well-Being

Although more conclusive scientific evidence is still needed to validate the effects of noise on health [33], noise pollution can be considered the second-biggest threat to people's health, just behind air pollution [34].

City dwellers are especially vulnerable to the effects of disturbing noises, which is a type of environmental pollution originating from vehicular traffic, air traffic, car sirens, commerce, industries, entertainment venues, and stadiums, among others [35]. The presence of noise in the urban environment increases in densely populated areas, where the population is affected by negative externalities caused by the excessive concentration of people [36,37]. Even though some of the better-known effects of noise on health are hearing loss and tinnitus (ringing in the ears) [38,39], those are not the only possible consequences. Regarding physical health, exposure to noise pollution has been linked to heart and metabolic diseases, high blood pressure, low birth weight, diabetes, and sleep problems [40–43]. This last one is the most commented on since as a product of bad rest, there are symptoms of discomfort, a lack of concentration in daily activities, or stress [44–46].

A lack of concentration, the inability to adequately perform regular activities, and generalized annoyance are symptoms that have alerted environmental epidemiologists about the possible relationships between noise and well-being [46]. Those adults who report higher levels of annoyance with environmental noise also report worse states of mental health [47]. The consequences of environmental pollution are not limited to the adult population. Pregnant mothers and their babies can be highly affected by excessive

noise levels. This exposure at such an early age affects the proper development of the fetus and the long-term implications remain undetermined, although anxiety disorders, impaired spatial memory, and impaired hippocampal plasticity are already being discussed as possible consequences in postnatal life [48].

Despite the amount we have learned in recent decades about the adverse effects of pollution on health, there is still much to be discovered in the field of human health and subjective well-being. Additionally, understanding perceptions regarding urban pollution is an open field to be explored for better bottom-up urban and local planning. In Latin American cities, important advances are evident in the monitoring of environmental pollution [49]. However, it is necessary to take new steps and examine the implications of this pollution on people. Through an evaluation of perceptions of city dwellers, this study aims to assess the impact of perceptions of air and noise pollution on subjective well-being while simultaneously contributing to the development of a baseline for this matter in Latin America. The objective of this study is not to apply a psychological assessment to urban residents but rather to explore possible associations between perceptions of the urban environment and perceptions of health, happiness, and satisfaction with life. The selection of our study area, Quito (Ecuador), is justified since in addition to having environmental monitoring for more than a decade, the geographical conditions make the city a place more likely to encapsulate environmental pollution [50], and there is limited information about pollution perceptions, although this city is a region where there is exposure to pollution and noise for its inhabitants.

2. Materials and Methods

An online survey was designed with 17 questions encompassing the topics of socioeconomic conditions and demographics, air pollution, noise pollution, and well-being-related variables. The survey was carried out in Quito (Figure 1), in January 2020. We applied an online survey in the context of the social distancing applied in Quito due to the COVID-19 pandemic. Using a snowball strategy via E-mail and social networks, we obtained 269 valid responses.

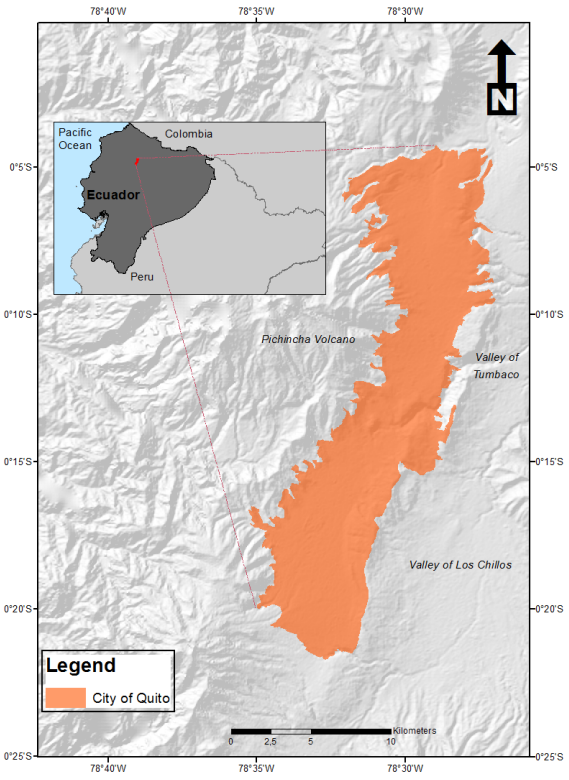

Figure 1. Study area.

The survey included an informative section where the participant's consent was requested, a socioeconomic and demographic information section that includes variables of sex, age, education, marital status, and income, a section related to visual/olfactory air pollution and noise pollution, perceived by people in their immediate surroundings (the block surrounding their households), and a section dedicated to the variables of self-perceived health, self-perceived happiness, and satisfaction with life. Socioeconomic and demographic variables were selected based on a literature review of the associations of these variables with mental health and well-being [51–58]. These kinds of variables can be considered significant covariates of urban residents' subjective well-being and health [59].

All the variables of air and noise pollution used a 4-category Likert scale, where a value of 1 was assigned to the "lower" category and the value of 4 was assigned to the "higher" category. For instance, the categories of the variable of visual air pollution received the following values, Not at all polluted = 1, Slightly polluted = 2, Moderately polluted = 3, and Very polluted = 4, while the categories of the variable of noise pollution (noise affecting well-being), Never, Rarely, Sometimes, and Always, received the values of 1, 2, 3, and 4, respectively.

The variable sex was coded with Female = 1, Male = 2, age and income were coded using a 5-point Likert scale (e.g., 18–21 = 1, >54 = 5; USD 0–USD 400 = 1, USD 2001 or more = 5), education was defined with a 4-point Likert scale (e.g., Basic = 1, Postgraduate studies = 4), and marital status was defined as a nominal variable of 4 categories (Single = 1, Married = 2, Divorced = 3, Widowed = 4).

The dependent variables, self-perceived health, self-perceived happiness, and satisfaction with life used a 4-category Likert scale, where a value of 1 was assigned to the "lower" category and the value of 4 was assigned to the "higher" category. The categories of the variable of self-perceived health received the following values: Not being healthy = 1, Having poor health = 2, Being healthy = 3, and Being very healthy = 4. The categories of the variable of self-perceived happiness received the following values: Not being happy = 1, Having low levels of happiness = 2, Being happy = 3, and Being very happy = 4. The categories of satisfaction with life received the following values: Not being satisfied with life = 1, Having low satisfaction with life = 2, Being satisfied with life = 3, and Being very satisfied with life = 4.

We calculated three ordinal logistic regression models considering the dependent variables of self-perceived health, self-perceived happiness, and satisfaction with life. This investigation uses these variables as proxies to represent people's well-being and (mental) health. The independent variables used for the models were the variables of perceptions of air pollution and noise pollution, and the socioeconomic and demographic (confounders) variables of sex, age, education, marital status, and income. A variable of perception of the quality of health services was also considered in the models, to control the regressions in terms of healthcare accessibility.

An ordinal logistic regression can be expressed with the following equation

$$logit(P(Y \leq j)) = \beta_{j0} + \beta_{j1}X_1 + \beta_{j2}X_2 + \ldots + \beta_{jp}X_p$$

where $j = 1, \ldots, J-1$ and p are the predictors X of Y.

Multicollinearity between independent variables was evaluated by applying correlation analyses, before the application of the ordinal logistic regression models. None of the correlations were higher than 0.8.

3. Results

Table 1 summarizes in percentages the socioeconomic and demographic information of the interviewees. In total, 70.60% of the interviewees were female and 29.40% were male. Of the responses received, 43.50% corresponded to the age range of 18 to 24 years, followed by 31.60% in the range of 25 to 34 years old, 8.60% between 35 and 44, 7.10% between 45 and 54, and 9.3% over 54. Regarding the education variable, 15.20% had graduated from high school, 66.50% of the respondents were studying or had completed their higher education, and 16.4% had completed postgraduate studies. In total, 74.30% were single,

21.20% were married, 3.70% were divorced, and 0.70% widowed. Regarding the monthly income of the interviewees, 49.40% reported receiving between USD 0 and USD 400 per month, 24.90% were earning between USD 401 and USD 800, and 10.40% had an income between USD 801 and USD1200.

Table 1. Summary of socioeconomic and demographic variables.

Variable	Category	Percentage
Sex	Female	70.60
	Male	29.40
Age	18–24	43.50
	25–34	31.60
	35–44	8.60
	45–54	7.10
	>54	9.30
Education	Basic	1.90
	High school	15.20
	Higher education	66.50
	Postgraduate studies	16.40
Marital status	Single	74.30
	Married	21.20
	Divorced	3.70
	Widow	0.70
Income	USD 0–USD 400	49.40
	USD 401–USD 800	24.90
	USD 801–USD 1200	10.40
	USD 1201–USD 1600	5.60
	USD 1601–USD 2000	4.80
	USD 2001 or more	4.80

Table 2 indicates the percentages of responses of each category of the dependent variables and independent variables of perceived pollutions. Most of the interviewees reported being healthy (72.20%), being happy (53.90%), and being satisfied with life (52.80%). Being very happy and being very satisfied with life also had notable percentages, 29.70% and 26.80%, respectively. Regarding visual air pollution, most of the interviewees reported that the air is slightly polluted (51.70%) or moderately polluted (34.20%). In total, 46.50% of people mentioned that they rarely perceive unpleasant odors in their neighborhoods and 37.90% reported that they sometimes perceive unpleasant noises.

Table 2. Summary of dependent variables and independent variables of perceived pollutions.

Variable	Category	Percentage
Self-perceived health	Not being healthy	0.70
	Having poor health	14.50
	Being healthy	72.20
	Being very healthy	12.60

Table 2. *Cont.*

Variable	Category	Percentage
Self-perceived happiness	Not being happy	3.00
	Having low levels of happiness	13.40
	Being happy	53.90
	Being very happy	29.70
Satisfaction with life	Not being satisfied with life	3.30
	Having low satisfaction with life	17.10
	Being satisfied with life	52.80
	Being very satisfied with life	26.80
Air pollution (visual)	Not at all polluted	7.80
	Slightly polluted	51.70
	Moderately polluted	34.20
	Very polluted	6.30
Air pollution (unpleasant odors)	Never	9.70
	Rarely	46.50
	Sometimes	36.80
	Always	7.10
Noises affecting well-being	Never	7.10
	Rarely	29.70
	Sometimes	37.90
	Always	25.30

Table 3 shows the results of the model with self-perceived health as the dependent variable. Overall, the model explained 27% of the variability of the dependent variable (Nagelkerke $R^2 = 0.27$).

Table 3. Results of the regression model with the dependent variable of self-perceived health.

Variable	Category	Estimate	*p*-Value	Odds Ratio	95% Confidence Intervals	
					Lower	Upper
Air pollution (visual)	Not at all polluted	0.32	0.70	1.38	0.27	7.13
	Slightly polluted	0.43	0.51	1.53	0.44	5.39
	Moderately polluted	0.41	0.53	1.51	0.43	5.27
	Very polluted	0	-	1	-	-
Air pollution (unpleasant odors)	Never	1.39	0.08 *	4.00	0.83	19.42
	Rarely	0.44	0.48	1.55	0.45	5.27
	Sometimes	0.52	0.40	1.68	0.49	5.67
	Always	0	-	1	-	-
Noises affecting well-being	Never	0.89	0.19	2.43	0.64	9.17
	Rarely	0.39	0.36	1.47	0.63	3.42
	Sometimes	0.87	0.02 **	2.38	1.11	5.09
	Always	0	-	1	-	-

Table 3. *Cont.*

Variable	Category	Estimate	*p*-Value	Odds Ratio	95% Confidence Intervals	
					Lower	Upper
Healthcare services quality	Not at all efficient	−2.12	0.01 **	0.12	0.02	0.59
	A little efficient	−2.87	0.00 ***	0.06	0.01	0.22
	Moderately efficient	−2.12	0.00 ***	0.12	0.03	0.45
	Very efficient	0	-	1	-	-
Sex	Female	−0.57	0.10	0.57	0.29	1.13
	Male	0	-	1	-	-
Age	18–24	1.44	0.04 **	4.23	1.08	16.56
	25–34	1.26	0.06 *	3.52	0.97	12.75
	35–44	1.921	0.01 **	6.83	1.59	29.24
	45–54	0.30	0.68	1.36	0.32	5.69
	>54	0	-	1	-	-
Education	Basic	−0.07	0.95	0.94	0.09	9.54
	High school	−1.209	0.06 *	0.29	0.09	1.03
	Higher education	−0.82	0.09 *	0.44	0.17	1.13
	Postgraduate studies	0	-	1	-	-
Marital status	Single	−0.80	0.66	0.45	0.01	13.51
	Married	−0.59	0.75	0.55	0.02	17.58
	Divorced	1.34	0.49	3.83	0.09	159.81
	Widow	0	-	1	-	-
Income	USD 0–USD 400	0.18	0.84	1.19	0.21	6.61
	USD 401–USD 800	0.37	0.65	1.44	0.28	7.49
	USD 801–USD 1200	1.36	0.12	3.89	0.67	22.44
	USD 1201–USD 1600	−1.01	0.25	0.36	0.07	2.02
	USD 1601–USD 2000	1.58	0.09 *	4.87	0.74	31.89
	USD 2001 or more	0	-	1	-	-

Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Regarding the olfactory air pollution categories, "Never" was found to be significant at 90% confidence to explain self-perceived health. The odds ratio (OR) suggests that perceiving good health was 4.00 times greater for respondents who reported never perceiving unpleasant odors than for those who perceive unpleasant odors.

For the noise pollution variable, the experience of discomfort "Sometimes", could explain self-perceived health at 95% confidence. The relative odds of perceiving good health were 2.38 times greater for respondents who reported sometimes perceiving disturbing noises than for those who continuously perceive unpleasant odors. The healthcare services' quality was also found to be significant.

Being in the age range between 18 and 44, and having a high school/higher education influenced self-perceived health. Having an income between USD 1601 and USD 2000 was also found to be significant at 90% confidence.

Table 4 shows the results of the regression model with the dependent variable of self-perceived happiness. The Nagelkerke coefficient R^2 was 0.313; that is, the categories found to be significant explained the variability in self-perceived happiness up to 31%.

Table 4. Results of the regression model with the dependent variable of self-perceived happiness.

Variable	Category	Estimate	*p*-Value	Odds Ratio	95% Confidence Intervals	
					Lower	Upper
Air pollution (visual)	Not at all polluted	−0.32	0.68	0.72	0.16	3.34
	Slightly polluted	−0.87	0.15	0.42	0.13	1.34
	Moderately polluted	−0.44	0.46	0.64	0.20	2.04
	Very polluted	0	-	1	-	-
Air pollution (unpleasant odors)	Never	2.12	0.00 ***	8.36	1.89	36.88
	Rarely	0.47	0.40	1.59	0.54	4.74
	Sometimes	1.17	0.03 **	3.23	1.09	9.57
	Always	0	-	1	-	-
Noises affecting well-being	Never	1.89	0.00 ***	6.62	1.94	22.56
	Rarely	0.47	0.22	1.59	0.76	3.35
	Sometimes	0.49	0.15	1.63	0.84	3.16
	Always	0	-	1	-	-
Healthcare services quality	Not at all efficient	−2.84	0.00 ***	0.06	0.01	0.32
	A little efficient	−2.08	0.01 **	0.12	0.03	0.58
	Moderately efficient	−1.43	0.06 *	0.24	0.05	1.10
	Very efficient	0	-	1	-	-
Sex	Female	0.07	0.82	1.07	0.59	1.94
	Male	0	-	1	-	-
Age	18–24	−0.29	0.66	0.75	0.21	2.67
	25–34	−0.78	0.22	0.46	0.13	1.56
	35–44	0.31	0.65	1.36	0.36	5.17
	45–54	−0.41	0.59	0.67	0.16	2.78
	>54	0	-	1	-	-
Education	Basic	2.62	0.05 *	13.77	1.06	179.29
	High school	0.21	0.70	1.23	0.42	3.67
	Higher education	−0.80	0.06 *	0.45	0.19	1.03
	Postgraduate studies	0	-	1	-	-
Marital status	Single	2.96	0.04 **	19.23	1.26	293.09
	Married	3.12	0.03 **	22.68	1.39	370.72
	Divorced	3.39	0.03 **	29.85	1.39	638.41
	Widow	0	-	1	-	-
Income	USD 0–USD 400	−0.89	0.27	0.41	0.09	1.91
	USD 401–USD 800	−0.36	0.64	0.69	0.16	3.07
	USD 801–USD 1200	0.82	0.32	2.26	0.47	10.95
	USD 1201–USD 1600	−0.62	0.45	0.54	0.11	2.57
	USD 1601–USD 2000	−0.15	0.87	0.86	0.15	4.82
	USD 2001 or more	0	-	1	-	-

Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The level of self-perceived happiness could be explained by the perception of air pollution (unpleasant odors) in its categories of "Never" (99% of confidence) and "Sometimes" (95% of confidence), with positive estimates of 2.12 and 1.17, respectively. The OR shows that perceiving happiness was 8.36 and 3.23 times greater for those who never and sometimes (respectively) perceive unpleasant odors than for those who always perceive unpleasant odors.

Regarding the noise pollution variable, the category "Never" was highly significant in explaining self-perceived happiness. The relative odds of perceiving happiness were 6.62 times greater for respondents reporting never perceiving noises that could affect their well-being than for those perceiving disturbing noises. The healthcare services' quality was also found significant.

Basic education and higher education could explain self-perceived happiness at 90% confidence. Marital status was a significant variable to explain self-perceived happiness.

Table 5 shows the results of the regression model with the dependent variable of satisfaction with life. The Nagelkerke coefficient R^2 was 0.292.

Table 5. Results of the regression model with the dependent variable of satisfaction with life.

Variable	Category	Estimate	*p*-Value	Odds Ratio	95% Confidence Intervals	
					Lower	Upper
Air pollution (visual)	Not at all polluted	−0.38	0.61	0.69	0.16	2.95
	Slightly polluted	−0.56	0.32	0.57	0.18	1.74
	Moderately polluted	0.22	0.69	1.25	0.41	3.82
	Very polluted	0	-	1	-	-
Air pollution (unpleasant odors)	Never	1.70	0.02 **	5.49	1.34	22.46
	Rarely	0.39	0.47	1.49	0.52	4.25
	Sometimes	1.14	0.04 **	3.13	1.09	8.97
	Always	0a	-	1	-	-
Noises affecting well-being	Never	1.69	0.00 ***	5.46	1.65	18.07
	Rarely	0.24	0.52	1.27	0.60	2.65
	Sometimes	0.16	0.63	1.17	0.61	2.23
	Always	0	-	1	-	-
Healthcare services quality	Not at all efficient	−1.78	0.02 **	0.17	0.04	0.74
	A little efficient	−1.69	0.01 **	0.18	0.05	0.66
	Moderately efficient	−0.78	0.24	0.46	0.13	1.62
	Very efficient	0	-	1	-	-
Sex	Female	0.04	0.89	1.04	0.59	1.85
	Male	0	-	1	-	-
Age	18–24	0.27	0.66	1.32	0.40	4.34
	25–34	−0.99	0.09 *	0.37	0.12	1.16
	35–44	0.51	0.43	1.67	0.47	5.92
	45–54	0.46	0.51	1.58	0.41	6.02
	>54	0	-	1	-	-
Education	Basic	3.87	0.00 ***	47.94	3.44	668.73
	High school	0.20	0.71	1.22	0.43	3.45
	Higher education	−0.19	0.64	0.83	0.38	1.81
	Postgraduate studies	0	-	1	-	-
Marital status	Single	2.69	0.06 *	14.70	0.92	233.69
	Married	2.33	0.11	10.28	0.617	171.46
	Divorced	2.89	0.07 *	17.93	0.844	380.84
	Widow	0	-	1	-	-
Income	USD 0–USD 400	−1.19	0.12	0.30	0.07	1.28
	USD 401–USD 800	−0.78	0.29	0.458	0.11	1.86
	USD 801–USD 1200	0.77	0.33	2.16	0.49	9.43
	USD 1201–USD 1600	−0.71	0.37	0.489	0.110	2.168
	USD 1601–USD 2000	−0.24	0.77	0.79	0.16	3.95
	USD 2001 or more	0	-	1	-	-

Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

"Never" and "Sometimes" having perceived unpleasant odors in their neighborhoods could affect the variable of satisfaction with life at 95% confidence. The relative odds of being satisfied with life were 5.49 and 3.13 times greater for respondents who reported never and sometimes perceiving unpleasant odors, respectively, than for those who reported always perceiving unpleasant odors.

"Never" having perceived disturbing noises in the neighborhood influenced satisfaction with life; that is, the relative odds of being satisfied with life were 5.46 times greater for those who never perceived a disturbing noise than for those who reported the perception of disturbing noise.

Age between 25 and 34, having a basic education, being single, being divorced, and healthcare services' quality could also influence satisfaction with life.

4. Discussion

This study evaluates the possible influence of perceptions of air pollution/noise on perceptions of health, satisfaction with life, and happiness. The study also uses socioeconomic and demographic determinants to be assessed in the performed models.

We found influences of air pollution (unpleasant odors) and noise on the dependent variables: never perceiving unpleasant odors in the air significantly influences self-perceived health, self-perceived happiness, and satisfaction with life; never perceiving disturbing noises impacts self-perceived happiness and satisfaction with life; sometimes perceiving disturbing noises may influence self-perceived health. The results of the present study are in line with previous research that found significant influences of odor and noise annoyances on subjective well-being and health [60]. These findings have practical implications regarding the quality of life and public health for urban residents. For instance, people perceiving unpleasant odors more often move out of their homes [61], and odor pollution can trigger symptoms of poor health [62], while noise pollution affects mental well-being causing symptoms such as anxiety and stress in urban dwellers [59]. The level of recognition of the damage caused by noise, although still in development, is much lower than what we know about the effects of other types of environmental pollution [63]. However, our results are consistent in terms of having low or null levels of noise associated with being satisfied with life and being happy.

We did not find an influence of visual air pollution on the dependent variables. According to the air quality reports from the Office of Environment of the Municipality of Quito, the quality of air in Quito remained within the "Desirable" categories (0–50) and "Acceptable" (50–100) in the IQCA (local air quality index). The IQCA [64] is a reference index based on international recommendations and can be compared to the AQI (Air Quality Index). This finding is in accordance with previous research [18], which states that polluted air is not a perceivable problem until it exceeds 140 AQI and does not cause discomfort/discomfort with the environment until it exceeds 150 in the AQI. Considering that the values of air pollution in Quito have not exceeded these limits, this result could also support why air quality does not appear as the main problem to be addressed in Quito, as indicated by the "Citizen Perception Survey" of the project "Quito cómo vamos" [65]. Along the same lines, the consistency in all the models of significant values for the variable of "Never" experiencing unpleasant odors contrasts with the relatively low pollution rates recorded in the city. However, this situation does not rule out the potential health effects of air pollution, especially among the most vulnerable people [8,66].

The quality of healthcare services was found to be significant for explaining the dependent variables. Access to healthcare services of quality is an element of people's well-being. Previous research has found that access to healthcare services of quality is associated with well-being perceptions, such as healthcare satisfaction and self-reported health [67,68]. By not considering healthcare as an efficient service, individuals can be affected in such a way that their perceptions of health, happiness, and satisfaction with life are impaired, which would ultimately lead to a greater degree of dissatisfaction and lower mental health.

Age ranging between 18 and 44 may influence self-perceived health and satisfaction with life. As indicated by previous research, generations between these age ranges correspond to those who in recent years have shown greater concern for their comprehensive health and greater interest in receiving psychological therapy [69]. Basic education may explain self-perceived happiness and satisfaction with life, and higher education could influence self-perceived happiness. Previous research has found associations between education and satisfaction with life [70], as well as other studies that have shown that education creates conditions that positively relate to happiness [71], both results closely related to the ones of this study. In the city of Quito, there is a disproportion in the levels of attention that women and men give to environmental pollution [72]. This author indicates that women have a greater concern for the environment. However, in the case of our investigation, none of the models produced results that indicated something similar: the sex of the participants remained a non-significant variable.

Limitations of the Study

The present research has some limitations, which, nevertheless, are opportunities for future investigations. The used survey is a convenience survey, carried out during the COVID-19 pandemic social distancing measures. Thus, although the findings of this investigation are in accordance with previous research, these results should not be extended to interpret the reality of the entire population of the study area, and the significance levels of the independent variables should be interpreted with prudence. This suggestion goes in line with the possibility of misinterpreting the effects of exposure variables (e.g., unpleasant noise) due to the presence of confounders in the models (e.g., sex, age) [73], and with the presence of large confidence intervals in some independent variables, which indicates a sample size that does not represent the entire population. We suggest that future researches related to this study apply different survey strategies to represent the entire population and experiment with different models with additional confounders, and without any confounders.

The considered dependent variables are useful measures of subjective well-being and health. However, these measures cannot be considered a standard of assessment of mental health. Even when the aim of this study was not to medically diagnose any mental disorder, we believe that other measures can be used to represent subjective well-being and health. For instance, future research can use the DASS scale (Depression Anxiety Stress Scales), developed to measure negative emotional states [74]. We did not consider any biomedical factor as an independent variable, such as medication use or diagnosis of mental health. Although our study is not biomedical, we believe that future investigations may incorporate additional independent variables representing the physical and medical condition of interviewees. The present study did not consider any pollutant measure as an independent variable due to the aim of our research being centered on perceptions. The calculated models are applied at an individual level, and, usually, data on pollutants are obtained at the area level. However, we believe that the regression models can be enriched by incorporating pollutant measures as independent variables, and we consider that succeeding investigations can incorporate these kinds of measures to assess mental health and well-being.

5. Conclusions

The results of this investigation show the influence of olfactory pollution and noise pollution on self-perceived health, self-perceived happiness, and satisfaction with life. The obtained results also show the importance of socioeconomic and demographic determinants to assess subjective well-being. A better quality of the environment can determine better subjective well-being that, consequently, may become a barrier against poor mental health. Our study reveals the importance of considering people's perceptions when assessing environmental and health/well-being conditions of urban environments. We argue that environmental quality should not only be interpreted in terms of physical measures but

also in terms of qualitative measures obtained from urban inhabitants. Furthermore, our study is part of a shift in the way how urban social–environmental links are measured, a change that is oriented towards applying more social and pluralistic approaches, beyond the use of traditional physical–environmental variables. We expect that the results of the present research can be considered by local stakeholders and decision makers to incorporate citizens' perspectives in urban environmental planning and pollution scrutiny, to construct a more inclusive sustainable future for the city.

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