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The Influence of Urban Housing Forms on Medical Pathology

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Abstract

This study examines the different effects of single-family and multi-family houses on the health of its resident children. In addition, diseases related to the floor in which the children reside are investigated, and diseases which are related to the living conditions of apartments are analyzed. In this study, we explain how housing form, children's age, gender, and dwelling floor affect the children's health, by analyzing pediatric medical records based on patients age one to twelve.

The relation of single and multi-family housing to children's health are examined, according to age, gender and dwelling floor. And the relationship between the frequency of each disease and independent variables are analyzed through the logit model.

The following is the are the analysis results of this study. First, children in their infancy paid the most visits to the hospital. The most common cause of the visit was found to be respiratory diseases. Second, the occurrence of respiratory diseases increased as children grew up. Third, children residing in multi-family houses showed a higher rate of respiratory problems than children living in single-family houses. However, stomach disease and allergies were more common in children living in single-family houses. Fourth, children who live in middle floors showed a higher rate of respiratory problems, while they had a lower chance of suffering from allergies than those living in higher floors.

Keywords: Residential Type, Medical Pathology Phenomenon, Children, health, logit model

1. Introduction

The increase in minor chronic illnesses and adult diseases in children has emerged as a major issue in the 1990's. However, there has not been an abundance of thorough research into the pathology of residents living in higher floors. The purpose of this study is to examine how single-family houses and multi-family houses are related to sickness in children. Diseases that exist on only certain floors are examined, and diseases related to apartments are analyzed.

Kim and others are focused that the increasing urban population is suffering from a ever worsening shortage of land. As the price of land continues to increase, efficient land use is emerging as an important challenge. To enhance efficiency, more apartments are being constructed than single-family houses. Apartments exceeding 20~30 floors have settled in most new cities surrounding the metropolitan area, in accordance to new laws which promote the construction of higher apartment in new cities.[1]

However, Sim and others was researched that the higher floors and higher density have brought along with it increased psychological stress regarding the residential environment. Previous studies on residential satisfaction in apartments have shown that deteriorated health in residents living on the higher floors can be accredited to increased stress regarding the residential environment.[2] And Oh, residential atmosphere not only provides the foundation on which humans can build a pleasurable lifestyle, but is also directly related to the health of growing children.[3] Kim was studied that many studies about child development and housing have shown that the interior and exterior environments have a great influence on the development of the child.[4]

FIGURE 1. Location of Seoul

SCOPE AND METHOD OF STUDY

First, the data for this study were obtained through medical records from pediatrics in Yangcheon-gu, Seoul for a period of 1 year, from November 1999 to October 2000. Second, children between the ages of one to twelve living in both single-family and multi-family houses were selected as the objects of research.

FIGURE 2. Location of Yangcheon - gu

All resources used in the analysis are from SAS package.

1) To quantify the facts obtained in this study, the children's gender, age, housing form, and number of medical examinations are calculated into frequency and percentages.

2) ANOVA is used to analyze the children's gender, age and housing form, centering on the results acquired through the frequency analysis.

3) The relation between children's dwelling floors and number of medical examinations is analyzed through ANOVA.

4) Based on the results of ANOVA, the variables, which are determined to be similar, are used in the logit model in which the disease constitutes the independent variable.

In order to examine the relationship between residential environments and health conditions, all of the subject's personal characteristics (social, economic level, age, sex, and marriage condition), as well as regional characteristics (region, country), periodical characteristics and biological characteristics must be taken into consideration. However, it is difficult to comprehend a subject's social and economic level based on only their medical records. Medical records are records of a patient's diagnosis medical treatment. Although medical records are highly accurate, they are not representative of an entire residential area.[5]

2. The Analysis of the Resources

The data used in this study were one-year medical records from L pediatrics in Yang-cheon Gu, Seoul, from November 1999 to October 2000. The effects of housing forms on the health of children between one to twelve years of age are analyzed. Any inaccurate data (such as children who had given a relative's address) were omitted. Also, the publicly announced land prices and space for each address were noted, reducing inaccuracies that can arise from differences in living standards.

The average price of single-family housing is $ 856,671, and the average space is 50 pyong. The average public price of multi-family housing is $ 1,206,726, and the average space is 32 pyong. The addresses were divided into single-family houses and multi-family houses. Ages were also differentiated from infancy (ages 1-2), toddler hood (ages 3-4), early childhood (ages 5-7), and later childhood (ages 8-12). Dwelling floors are divided into lower floors (floor 1-5), middle floors (floor 6-10), and upper floors (exceeding floor 11). The diseases were classified into eight categories; respiratory disease, gastro-intestinal disease, skin disease, infectious disease, urogenital disease, eye disease, allergy, and external wound. The following is the categorized distribution of disease according to housing form.

Table 1. Distribution of disease according to housing form

Housing form / Disease	Single-family housing		Multi-family housing	
	Frequency	%	Frequency	%
Respiratory organs disease	12,658	73.59	3,448	76.05
Stomach and intestines disease	2,013	11.70	460	10.15
Skin disease	894	5.20	221	4.87
Infectious disease	431	2.51	126	2.78
Urogenital organs disease	50	0.29	14	0.31
Eye disease	607	3.53	150	3.31
Allergy	504	2.93	106	2.34
External wound	44	0.26	9	0.20
Total	17,201	100.00	4,534	100.00

1,658 children from single-family houses visited the hospital for illness in the respiratory system. This constitutes 73.59% of all the children residing in single-family houses. 11.70 % of children residing in single-family houses visited the hospital for

gastro-intestinal illnesses, while 5.20% were examined for skin disease, 3.53% for eye disease, 2.93% for allergies, 2.51% for infectious diseases, 0.29% urogenital diseases, and 0.26% for external wounds. Also, 3,448 children from multi-family houses visited the hospital for respiratory problems. This is 76.05% of the total number of children living in multi-family houses included in our study. 10.15% of children residing in multi-family houses suffered from gastro-intestinal illnesses; 4.87% were treated for skin diseases, while 3.31% were treated for eye disease, 2.78% for infectious diseases, 2.4% for allergies, 0.31% for urogenital disease, and 0.20% for external wounds. Thus, the illnesses suffered by children from single-family houses and those from multi-family houses differed somewhat in their content. The following is the distribution of disease according to gender.

Table 2. Distribution of disease according to gender (single-family housing)

Housing form / Disease	Single-family housing			
	Boy		Girl	
	Frequency	%	Frequency	%
Respiratory organs disease	6,557	73.20	6,102	74.02
Stomach and intestines disease	1,091	12.18	922	11.18
Skin disease	458	5.11	436	5.29
Infectious disease	229	2.56	202	2.45
Urogenital organs disease	24	0.27	26	0.32
Eye disease	307	3.43	300	3.64
Allergy	266	2.97	238	2.89
External wound	26	0.29	18	0.22
Total	8958	100.00	8244	100.00

The results of the analysis show that 73.20% of male children from single-family houses visited the hospital for respiratory problems. 12.18% were treated for gastro-intestinal problems, 5.11% for skin related illnesses 3.43% for eye diseases, 3.43% for allergies, 2.56% for infectious diseases, 0.27% for argental diseases, and 0.29% for external wounds. The percentage of young girls who went to the hospital for respiratory disease in single-family housing was 74.02%, gastro-intestinal diseases 11.18%, skin diseases 5.29%, eye diseases 3.64, allergies 2.89%, infectious diseases 2.45%, urogenital disease 0.32%, and external wounds 0.22%. There was generally an even distribution of boys and girls from single-family houses who went to the hospital for each disease.

According to the results of the analysis, 75.39% of male children from multi-family houses went to the hospital for respiratory problems, 11.04% for gastro-intestinal problems, 4.76% for skin related illnesses 3.23% for eye diseases, 2.11% for allergies, 3.10% for infectious diseases, 0.17% for argental diseases, and 0.21% for external wounds. The percentage of female children who went to the hospital because of respiratory disease in multi-family housing was 76.78%, gastro-intestinal diseases 9.13%, skin diseases 5.01%, eye diseases 3.40%, allergies 2.60%, infectious diseases 2.41%, Urogenital disease 0.47%, and external wounds 0.19%. Although there was not a large difference in the frequency of hospital visits between boys and girls from both single-family and multi-family houses, the number of boys who visited the hospital for argental diseases and allergies were higher than that of girls. The following table shows the frequency of illness according to age for resident children in single-family houses. (Table 4)

Table 3. Distribution of disease by according to gender (multi-family housing)

Housing form / Disease	Multi-family housing			
	Boy		Girl	
	Frequency	%	Frequency	%
Respiratory organs disease	1,823	75.39	1,624	76.78
Stomach and intestines disease	267	11.04	193	9.13
Skin disease	115	4.76	106	5.01
Infectious disease	75	3.10	51	2.41
Urogenital organs disease	4	0.17	10	0.47
Eye disease	78	3.23	72	3.40
Allergy	51	2.11	55	2.60
External wound	5	0.21	4	0.19
Total	2418	100.00	2115	100.00

Table 4. Distribution of disease according to age (single-family housing)

Housing form Disease	Single-family housing							
	Infant		Babyhood		Former child		After child	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Respiratory organs disease	5,541	66.80	3,447	77.65	2,786	82.33	885	81.64
Stomach and intestines disease	1,249	15.06	401	9.03	242	7.15	121	11.16
Skin disease	587	7.08	199	4.48	85	2.51	23	2.12
Infectious disease	195	2.35	97	2.19	111	3.28	28	2.58

Urogenital organs disease	18	0.22	19	0.43	13	0.38	0	0.00
Eye disease	340	4.10	161	3.63	87	2.57	19	1.75
Allergy	334	4.03	104	2.34	58	1.71	8	0.74
External wound	31	0.37	11	0.25	2	0.06	0	0.00
Total	8295	100	4439	100	3384	100	1084	100

In single-family houses, older children paid more visits to the hospital for respiratory diseases. Infants were mostly treated for gastro-intestinal diseases (15.06%), and the rate decreased upon becoming toddler (9.03) and during early childhood (7.15%). However, the rate increased after childhood. Also, the rate for skin disease, eye disease, allergies, and external wounds decreased as the child went from infanthood to childhood, but increased again after childhood (11.16%). Children had the lowest rate for infectious diseases during toddler hood (2.19%), and the highest rate during early childhood (3.28%). The following shows the distribution of disease according to age for resident children in multi-family houses.

Table 5. Distribution of disease according to age (multi-family houses)

Housing form / Disease	Multi-family housing							
	Infant		Babyhood		Former child		After child	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Respiratory organs disease	1,358	68.83	1,052	81.17	749	81.68	288	83.00
Stomach and intestines disease	277	14.04	88	6.79	60	6.54	35	10.09
Skin disease	135	6.84	55	4.24	25	2.73	6	1.73
Infectious disease	41	2.08	30	2.31	46	5.02	9	2.59
Urogenital organs disease	1	0.05	8	0.62	4	0.44	1	0.29
Eye disease	85	4.31	42	3.24	20	2.18	3	0.86
Allergy	71	3.60	19	1.47	11	1.20	5	1.44
External wound	5	0.25	2	0.15	2	0.22	0	0.00
Total	1973	100	1296	100	917	100	347	100

Among children from multi-family houses, older children showed a higher rate of respiratory diseases. In the case of gastro-intestinal diseases, occurrences decreased, as the child got older, as the case with single-family houses, with a 14.04% during infanthood, 6.79% in toddler hood, and 6.54% in early childhood. However, the rate increased again as the child entered into later childhood, to 10.09%. Infants showed the highest rate of skin diseases at 6.84%, while children in their post-later childhood years showed the lowest rate with 1.73%. Children showed similar rates of occurrence of infectious diseases during infanthood (2.08%), toddler hood (2.31%), and later childhood (2.59%), but showed an unusually high rate of 5.02% during their early childhood years. Children in their infanthood had the lowest rate of medical examinations for urogenital diseases at 0.05%, while children in their toddler hood had the highest rate at 0.68%. As the child entered early and later childhood, the rate decreased to 0.44% and 0.38%, respectively. The occurrence rate for eye diseases decreased, as the child got older, while children were more prone to respiratory diseases as they grew. To analyze the connection of the rate of disease occurrence to gender, age, and housing form, correlation analysis was used. The results are as shown below.

Table 6. Correlation of diseases to variables

	Sex	Age	Housing type	Disease number
Sex	1.00000			
Age	0.03217**	1.00000		
Housing type	0.00752	0.07526**	1.00000	
Disease number	-0.01101	-0.09445**	0.15371**	1.00000

** p< .01

The form of housing and the frequency of illness were found to have relatively little correlation (15%). Even though the frequency of illness had a negative correlation to both the sex and age of the child, this was not considered significant.

ANOVA by disease variable

ANOVA was used to examine if there were any differences in the frequency of illnesses according to gender, age and housing form. Housing forms were divided into single-family houses and multi-family houses. Age was divided into infanthood (ages 1-2), toddler hood (ages 3-4), early childhood (ages 5-7), and later childhood (ages 8-12). Data regarding external wounds were omitted, because of insufficient data acquired from the frequency analysis. The following are the results of primary ANOVA about disease according to gender.

Table 7. ANOVA for each disease according to gender

Source	Sum of square	D.F	Mean square	F value	Pr > F
Respiratory organs disease	19.99	1	19.99	2.09	0.1480
Error	42249.05	4424	9.55		
Total	42269.04	4425			
Stomach and intestines disease	1.96	1	1.96	1.74	0.1877
Error	1762.22	1565	1.13		
Total	1764.17	1566			
skin disease	0.69	1	0.69	0.91	0.3403
Error	577.18	763	0.76		
Total	577.87	764			
Infectious disease	0.06	1	0.06	0.53	0.4679
Error	52.59	503	0.10		
Total	52.64	504			
Urogenital organs disease	0.01	1	0.01	0.13	0.7244
Error	5.37	56	0.10		
Total	5.38	57			
Eye disease	0.45	1	0.45	1.54	0.2147
Error	179.78	615	0.29		
Total	180.23	616			
Allergy	0.29	1	0.29	1	0.3175
Error	140.95	491	0.29		
Total	141.23	192			

The results showed that in a 5% noticeable level for the correlation of the frequency of each illness and gender, the variable P was not meaningful. Therefore, it was determined that there was not a notable difference in the occurrence of diseases between boys and girls. Table 8. shows the results of the primary ANOVA on disease and gender.

Table 8. ANOVA for each disease and gender

Source	Sum of square	D.F	Mean square	F value	Pr > F
Respiratory organs disease	2114.82	3	704.94	77.63	0.0001
Error	40154.22	4422	9.08		
Total	42269.04	4425			
Stomach and intestines disease	111.83	3	37.28	35.26	0.0001
Error	1652.35	1563	1.06		
Total	1764.17	1566			
skin disease	15.08	3	5.03	6.80	0.0002
Error	562.79	761	0.74		
Total	577.87	764			
Infectious disease	0.46	3	0.15	1.48	0.2202
Error	52.18	501	0.10		
Total	52.65	504			
Urogenital organs disease	0.08	3	0.026	0.26	0.8540
Error	5.30	54	0.10		
Total	5.38	57			
Eye disease	1.24	3	0.41	1.41	0.2387
Error	179.00	613	0.29		
Total	180.24	616			
Allergy	1.25	3	0.42	1.46	0.2256
Error	139.98	489	0.29		
Total	141.23	492			

The results of the analysis show that in a 5% noticeable level, there was a disparity in the occurrence of respiratory diseases, gastro-intestinal diseases, and skin diseases according to age. As children advance through infanthood, toddler hood and early childhood, the frequency of medical visits for respiratory problems increased. However, there was not a significant difference in the occurrence between early and later childhood. Infants showed the highest rate of examination for gastro-intestinal disease, with the rate decreasing throughout the periods of toddler hood until early childhood. The rate increased once again in later childhood. Infants had the lowest rate of medical examination for skin disease, and the rate decreased as the child got older. It shows the result of the primary ANOVA on each disease and the form of housing (Table 9). According to the results, respiratory diseases, gastro-intestinal disease, and allergies show differences in frequency of occurrence according to the housing form in a 5 % noticeable level.

Therefore, children living in multi-family houses pay more visits to the hospital for respiratory problems than children of single-family houses. On the other hand, children from single-family houses had a higher occurrence rate of gastro-intestinal diseases. Children from multi-family houses showed a lower rate of allergies than children from single-family houses.

Table 9. ANOVA on each disease and housing form

Source	Sum of square	D.F	Mean square	F value	Pr > F
Respiratory organs disease	332.85	1	332.85	35.11	0.0001
Error	41936.19	4424	9.48		
Total	42269.04	4425			
Stomach and intestines disease	9.65	1	9.65	8.61	0.0034
Error	1754.52	1565	1.12		
Total	1764.17	1566			
skin disease	1.18	1	1.18	1.56	0.2125
Error	576.69	763	0.76		
Total	577.87	764			
Infectious disease	0.008	1	0.008	0.08	0.7826
Error	52.638	503	0.105		

Total	52.646	504			
Urogential organs disease	0.06	1	0.06	0.64	0.4283
Error	5.32	56	0.09		
Total	5.38	57			
Eye disease	0.49	1	0.49	1.67	0.1963
Error	179.74	615	0.29		
Total	180.23	616			
Allergy	1.39	1	1.39	4.9	0.0272
Error	139.84	491	0.28		
Total	141.23	192			

In order to determine if a relation exists between dwelling floors and diseases as proved by existing studies, data regarding children living in apartments were selected from the data pool. Based on this data, the relation between dwelling floors and diseases was examined. Apartment floors were divided into lower floors (floors 1-5), middle floors (floors 6-10), and upper floors (higher than floor 11). The following results were obtained.

Table 10. Distribution of disease according to floors (apartment)

Floor / Disease	Apartment					
	Lower floor (floor 1-5)		Middle floor (floor 6-10)		Upper floor (higher than floor 11)	
	Frequency	%	Frequency	%	Frequency	%
Respiratory organs disease	681	71.09	896	73.93	589	67.78
Stomach and intestines disease	126	13.15	123	10.15	115	13.23
Skin disease	51	5.32	66	5.45	64	7.36
Infectious disease	35	3.65	36	2.97	30	3.45
Urogenital organs disease	3	0.31	5	0.41	6	0.69
Eye disease	37	3.86	53	4.37	38	4.37
Allergy	25	2.62	30	2.48	22	2.53
External wound	0	0.00	3	0.25	5	0.58
Total	958	100.00	1212	100.00	869	100.00

According to the analysis, the frequency of hospital visits for respiratory diseases did not increase as the floor got higher. Respiratory problems in children living on the middle floors showed a high rate of 73.93%. Gastro-intestinal problems were less prevalent in middle floors (10.15%) than lower floors (13.15%) and upper floors (13.26%). Patterns for infectious diseases were similar to those of gastro-intestinal diseases, with a 2.97% rate of occurrence in middle floors 3.65% in lower floors, and 3.45% in upper floors. Urogenital diseases increased as the floors got higher. Children living in lower floors showed a lower rate of eye disease(3.86%) than those living in the middle floors(4.37%) and upper floors(4.37%). On the other hand, children living in the middle floors had a lower rate of allergies(2.48%) than children living in lower floors(2.02%) and upper floors(2.53%). There were no records of external wounds in children living in the lower floors, and the frequency increased as the floor got higher; children living in middle floors showed a rate of 0.25%, while those living in upper floors showed a rate of 0.58%.

The results of the frequency analysis showed different patterns in children living in the lower, middle, and upper floors. To prove such differences, ANOVA was used to examine the lower to middle, and middle to upper floors. Occurrences of urogenital diseases and external wounds were omitted from the study, for lack of suitable data. According to the results, significant differences existed only in the occurrence rate of respiratory problems, within a 10% noticeable level. Thus, children living in the lower floors showed a lower rate of respiratory problems than those living in middle floors.

Table 11. ANOVA on each disease according to dwelling floors (lower to middle)

Source	Sum of square	D.F	Mean square	F value	Pr > F
Respiratory organs disease	18.99	1	18.99	3.4	0.0656
Error	2996.05	537	5.58		
Total	3015.03	538			
Stomach and intestines disease	0.01	1	0.01	0.03	0.8722
Error	98.61	177	0.56		
Total	98.63	178			
Skin disease	0.10	1	0.10	0.22	0.6398
Error	37.56	85	0.44		
Total	37.66	86			
Infectious disease	0.00	1	0.00	0.00	0.9691
Error	5.45	63	0.09		
Total	5.45	64			
Eye disease	0.03	1	0.03	0.11	0.7450
Error	18.51	72	0.26		
Total	18.54	73			
Allergy	0.02	1	0.02	1.26	0.2676
Error	0.96	52	0.02		
Total	0.98	53			

The following are the results examining whether there is a difference in the number of medical examinations between the middle and upper floors.

Table 12. ANOVA on each disease according to dwelling floors (middle to upper)

Source	Sum of square	D.F	Mean square	F value	Pr > F
Respiratory organs disease	16.05	1	16.05	2.94	0.0871
Error	2741.50	502	5.5		
Total	2757.55	503			
Stomach and intestines disease	0.93	1	0.93	0.96	0.3293
Error	157.68	162	0.97		
Total	158.61	163			
skin disease	0.01	1	0.01	0.01	0.9064
Error	28.10	93	0.30		
Total	28.11	94			
Infectious disease	0.17	1	0.17	1.09	0.3018
Error	8.73	56	0.16		
Total	8.90	57			
Eye disease	0.04	1	0.04	0.10	0.7499
Error	26.55	73	0.36		
Total	26.59	74			
Allergy	0.29	1	0.29	5.4	0.0246
Error	2.53	47	0.05		
Total	2.82	48			

According to result of ANOVA, there was a difference in the frequency of hospital visits for respiratory diseases and allergies within the 10% noticeable level. Thus, children living in the middle floors paid more frequent visits to the hospital for respiratory problems than children living in the upper floors. Children residing in the middle floor showed lower rates for allergies than those in the upper floors.

Assumption and examination of model

The logit model was originally formulated to be applied to the incidence density, which is summarized by the Cohort study. However, it is based on the probability of disease occurrence due to exposure to dangerous elements during the all-theoretical process. Therefore, the preceding logit model is open to flexible statistical assumption in the patient-constant variable.

As proved by ANOVA, the occurrence of respiratory problems and the gastro-intestinal diseases showed different patterns according to age and housing forms. The results of an analysis of respiratory diseases obtained through a logit model including these two explanatory variables are shown in Table 3.3.1., which can also be expressed as shown in formula 3.3.1. The model for respiratory diseases showed a high estimated suitability rate (p^2) of 0.19.

Table 13. Relation model of the respiratory disease to age and housing form

Independent variable	Respiratory organs Disease (t value)	
Intercept	0.3824** (0.0000)	L(β) 24402.46
Age	0.3646** (0.0000)	L(0) 30131.108
Housing type (single = 0, multi = 1)	0.1052** (0.0074)	ρ 2 0.19
		x^2 (2) 59.50**

** p< 0.01

An examination of the probability model for being afflicted with respiratory diseases shows that the estimates are legitimate, as the variables for age and housing form have positive values. The value “t”, which represents the statistical similarity of the presumption factor, shows that all values of t are similar within a 0.01 noticeable level. Table 14. is the model factor for gastro-intestinal diseases. The expected model suitability (p^2) for gastro-intestinal disease showed a relatively high rate of 0.59.

Table 14. Relation model of the gastro-intestinal disease to age and housing form

Independent variable	Stomach and intestines disease (t value)	
Intercept	0.2608** (0.0000)	L(β) 104.9955
Age	-0.1004** (0.0371)	L(0) 14811.332
Housing type (single = 0, multi = 1)	0.1696** (0.0532)	ρ 2 0.59
		χ 2(2) 24.66**

** p< 0.1

An examination of the probability model for being afflicted with gastro-intestinal diseases shows that the estimates are legitimate, as the variable for age has a negative value, and the variable for housing form has a positive value.

3. Conclusions

In this project, the effect of housing forms on children's health was analyzed, based on medical records obtained from pediatric hospitals. A model was also established for examining the relationship between the occurrence of diseases and various factors. The results are as follows.

First, children in their infancy paid the most frequent visits to the hospital, mostly for respiratory problems. No significant relation was found between the gender of the child and the frequency of each of the eight diseases examined in this study(respiratory disease, gastro-intestinal disease, skin disease, infectious disease, urogenital disease, eye disease, and allergies). This implies that there is no significant difference between genders until children enter elementary school. It was also observed that both genders were equally prone to infections.

Second, the frequency of respiratory diseases increased with the age of the children, while the frequency of stomach diseases decreased as the child got older. This is because higher aged children have more contact with the outside environment, leaving them more susceptible to respiratory diseases such as the cold, from contact with other people. Infants have the highest rate of stomach diseases, because this is the period when the child learns to digest solid food. Thus, infants are afflicted with many gastro-intestinal diseases from excretion, sleep, and changing eating habits. However, it was observed that the living habits of children settle after infanthood. Children suffer from less skin diseases as they grow up, as the most common skin diseases are caused by diapers, Atopic dermatitis, and neonate jaundice, which are diseases mostly inflicted during infanthood. Therefore, skin diseases usually disappear, as the child grows older.

Third, an analysis of diseases according to housing form shows that children living in multi-family houses have more instances of respiratory diseases than children living in single-family houses. This is because these children are subject to higher density than those living in single-family houses. Dust, as well as the cold virus which shrinks the child's respiratory organs, are the main causes of asthma. The resident children in single-family houses have a higher rate of gastro-intestinal disease. Further studies are needed to verify the hypothesis than irregular eating habits cause such stomach diseases. In addition, children residing in single-family houses show a higher frequency for allergies. This is believed to be because allergic trinities and contact dermatitis are caused by anther dust in spring and the yellow dust phenomena. Previous studies have reported that people living in high apartment buildings are more prone to allergies, showing that a more diverse method of approach on the subject is necessary.

Fourth, in order to examine the relation between dwelling floors and diseases as presented in previous studies, records of children living in apartments were selected from the multi-family house data pool. The results of the analysis show that children living on the middle floors(floors 6-10) show a higher rate of respiratory problems that those living in upper floors. This is evidence of the seriousness of air pollution in the city. Smog, which is the main cause of air pollution, forms a layer in the air, blocking circulation. The reversal layer is formed during the late hours of the night, so the layer is heaviest around 6am, just before sunrise. Fog and dust are formed at this time. 75% of Korea is covered with mountainous regions, limiting the space available for apartments. To alleviate this problem, mountainous regions are leveled to provide construction sites. In this case, the inferior reversal layer formed at the mountain's breast affects the middle floor more than the lower and upper floors. Thus, residents of the middle floors suffer more from respiratory diseases, because the upper floors are further from the pollution factor. Therefore, leveling mountainous areas for apartment sites should be refrained from.

An analysis of diseases in relation to gender and housing form showed that there is a relation between the two variables and respiratory and gastro-intestinal diseases. Therefore, these two factors are used to formulate a probability model of being afflicted with respiratory diseases. The results are as follows.

First, people living in multi-family houses are found to have a higher level of respiratory problems than those living in single-family houses. Also, the probability of being inflicted with respiratory diseases increases with age. Second, stomach diseases are found in a higher rate in single-family houses than multi-family houses. In addition, affliction of stomach diseases increase with age, while respiratory diseases decrease. The prediction result of these two models were found to be legitimate.

Subjects for further study

This study analyzes the relation between diseases and the housing forms and dwelling floors, which are both physical elements which comprise residential environments. However, housing forms and dwelling floors are not representative of the overall residential environment, and the effect on the child's health is expected to be different if more explanatory factors are added to the analysis. Also, age and gender are not the main factors which characterize a person. In addition, as mentioned beforehand, a given hospital does not

represent the entire community, which poses a problem in stating that the data utilized in this study are inclusive of all residents in the community. Also, the duration of this study was limited to one year, and residents of similar economic levels were selected for our data, based on the publicly announced land price and area of the residence. Therefore, the data used in this study are not representative of all economic levels.

Therefore, in order to achieve a more conclusive study on the effects of residential environments on residents' health, further research is necessary through the cooperation of the medical and social sectors of a community, considering both the physical and individual variables of the local residents.

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