

논문 심사 시 유의사항

-통계분석과 연구결과 해석 부분

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목차

1. 통계분석 방법 확인 시 일반적 고려사항
2. 분석결과 제시 및 해석

통계분석법 확인 시 고려사항

“어떤 통계분석법을 사용하였는가?”

- 변수의 척도 (명목, 서열, 등간, 비율척도)
- 검정하고자 하는 통계량(평균값, 비율(%), 상관관계 등)
- 표본(대상자 수)의 크기와 분포
- 고려 해야 할 변수의 수(univariate vs. multivariate/
univariable vs multivariable)

분석결과 제시 및 해석

Two simple ways of results

표 (tables)

그림 (graph, figure)

- **Self-explanatory**
- **간결, 명료하게 작성**

Table & Figure

- **self-explanatory**

1) 표 : Title, Headings, **Foot note**, 통계분석법과 결과(t , χ^2 , p), **단위(unit)**

2) 그림 : 척도(간격), **범례(legend)**, symbol, **약어**, **Foot note** ..

- **간결하고 분명한 제목**

- **정보는 빠뜨리지 않되, 간단하게 작성되었는지**

- **선은 최소한으로 사용 : 종선은 금지, 횡선 만/ 횡 구분, 선 보다는 간격으로.**

- **단위 명시: 표 상단 우측 또는 해당 cell**

- **Foot note: 약자/기호 설명, 필요 시 해설, resource 명시**

분석 결과 제시

- Descriptive (Table 1)
- One-way comparison (Table 2)
- Correlation or Regression (Table 3)

Descriptive of Subjects

- 단순한 자료 설명
- 연구 대상자의 수
- 비교 및 일반화 문제로 인해 분석 시 제외된 대상
- Frequency, percentage, median, minimum, maximum

Table 3. Demographic characteristics of respondents (unit: persons, %)

		Frequency	%
Gender	Male	26,080	45.08
	Female	31,776	54.92
Age	19 years or below	16,148	27.91
	20-44 years	15,293	26.43
	45-64 years	15,908	27.50
	65 years or over	10,507	18.16
Education level	Middle school or lower	28,681	49.57
	High school	15,431	26.67
	College or higher	13,744	23.76
Income quartile	Low	14,400	25.00
	Low-middle	14,416	25.03
	High-middle	14,462	25.11
	High	14,316	24.86
Marital status	Unmarried	20,164	34.86
	Married	32,112	55.52
	Divorced/separated/widowed	5,560	9.61
Private insurance	Uninsured	17,563	30.29
	Fixed benefit insured	34,310	59.17
	Indemnity insured	6,115	10.55

단순히 연구대상의 분포 제시, 통계값 (P값) 제시 없다 !

Table 1 Descriptive Analysis of Dietary Variables (Age 36-60 Months Old) by Caries Category

Parameter		% Children with some consumption* (n = 377)	Median (25th, 75th percentile)			
			Caries-free (n = 248)	d ₁ (n = 38)	d _{2+f} (n = 45)	d ₁ d _{2+f} (n = 46)
Beverage (occasions/day)						
Powdered sugared beverages	Snack	36	0.0 (0.0, 0.1)	0.0 (0.0, 0.2)	0.0 (0.0, 0.3)	0.0 (0.0, 0.2)
	Meal	34	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.2)	0.0 (0.0, 0.1)
Regular soda pop	Snack	52	0.0 (0.0, 0.2)	0.0 (0.0, 0.2)	0.1 (0.0, 0.2)	0.1 (0.0, 0.3)
	Meal	71	0.2 (0.0, 0.3)	0.2 (0.1, 0.4)	0.2 (0.1, 0.4)	0.2 (0.1, 0.4)
Juice drinks	Snack	52	0.0 (0.0, 0.2)	0.1 (0.0, 0.3)	0.1 (0.0, 0.2)	0.1 (0.0, 0.3)
	Meal	56	0.1 (0.0, 0.2)	0.1 (0.0, 0.3)	0.1 (0.0, 0.2)	0.1 (0.0, 0.2)
100% Juice	Snack	80	0.3 (0.1, 0.7)	0.3 (0.1, 0.4)	0.3 (0.1, 0.7)	0.3 (0.0, 0.6)
	Meal	85	0.4 (0.1, 0.8)	0.4 (0.2, 0.7)	0.4 (0.1, 0.7)	0.3 (0.1, 0.8)
Milk	Snack	84	0.3 (0.1, 0.7)	0.2 (0.1, 0.6)	0.3 (0.1, 0.8)	0.3 (0.1, 0.7)
	Meal	99.7	1.8 (1.2, 2.2)	1.5 (1.0, 2.0)	1.7 (1.3, 2.1)	1.7 (0.9, 2.0)
Water	Snack	91	0.8 (0.3, 1.3)	0.6 (0.2, 1.1)	0.6 (0.2, 1.1)	0.4 (0.2, 0.9)
	Meal	65	0.1 (0.0, 0.3)	0.1 (0.0, 0.3)	0.1 (0.0, 0.3)	0.1 (0.0, 0.3)
Food (occasions/day)						
Presweetened cereals	Snack	29	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.0)
	Meal	86	0.3 (0.1, 0.6)	0.3 (0.2, 0.7)	0.3 (0.2, 0.7)	0.3 (0.1, 0.4)
Unsweetened cereals	Snack	20	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
	Meal	59	0.1 (0.0, 0.2)	0.1 (0.0, 0.3)	0.1 (0.0, 0.2)	0.1 (0.0, 0.2)
Baked starch with sugar	Snack	98	0.6 (0.4, 0.9)	0.7 (0.3, 0.9)	0.6 (0.3, 0.8)	0.6 (0.4, 1.0)
	Meal	86	0.3 (0.2, 0.6)	0.2 (0.0, 0.4)	0.3 (0.1, 0.6)	0.3 (0.1, 0.6)
Unprocessed starches	Snack	77	0.1 (0.0, 0.3)	0.2 (0.1, 0.3)	0.2 (0.1, 0.3)	0.2 (0.1, 0.4)
	Meal	100	2.6 (2.2, 2.8)	2.4 (2.0, 2.8)	2.3 (2.0, 2.8)	2.4 (2.2, 2.7)

See 1 citation found using an alternative search:

J Public Health Dent. 2015 Sep;75(4):265-73. doi: 10.1111/j.1752-7325.2012.00376.x. Epub 2012 Nov 8.

The associations between dietary intakes from 36 to 60 months of age and primary dentition non-cavitated caries and cavitated caries.

[Chankanka O](#)¹, [Levy SM](#)^{2,3}, [Marshall TA](#)², [Cavanaugh JE](#)⁴, [Warren JJ](#)², [Broffitt B](#)², [Kolker JL](#)⁵.

* Percentage of children with some consumption from diaries (among two or three annual time points per child).

One-way comparison

- 각각 설명변수와 결과변수의 비교 (t-test, ANOVA, Chi-square)
- 단순 중간 분석, 독자에게 유용한 정보 전달
- 결과나 논의에서 다루지 않음

Table 1. Relation between demographic characteristics, SEP indicators, relevant oral health-related behaviours with mental disorders and number of decayed teeth

	Depression			Anxiety			Number of decayed teeth		
	n	%	P-value	n	%	P-value	Mean	SD	P-value trend
Whole sample	1229	25.9		441	9.65		0.76	1.83	
Sex									
Male	474	22.15	<0.001	149	7.26	<0.001	1.07	2.28	<0.001
Female	755	29.39		292	11.81		0.48	1.28	
Age									
30–34	100	16.30	<0.001	52	8.92	0.101	0.56	1.44	0.018
35–44	246	19.53		139	11.15		0.67	1.81	
45–54	351	26.32		143	10.82		0.80	1.93	
55–65	251	30.70		66	8.34		0.81	1.95	
65 or more	281	40.49		41	6.55		0.99	1.90	
Marital status									
Cohabiting	780	22.55	<0.001	289	8.58	<0.001	0.66	1.68	<0.001
Living alone	449	35.66		152	12.70		1.07	2.23	
Education level									
Basic	508	33.23	<0.001	153	10.63	0.260	1.02	2.07	<0.001
Secondary	379	23.22		141	8.86		0.87	2.04	
Higher	341	21.72		147	9.54		0.40	1.26	
Income									
Low	371	31.89	<0.001	133	12.30	0.003	1.17	2.26	<0.001
Moderate	441	26.78		149	9.21		0.79	1.87	
High	417	21.83		159	8.53		0.51	1.49	
Diabetes									
No	1142	25.30	<0.001	424	9.72	0.512	0.74	1.84	<0.001
Yes	85	40.11		17	8.32		1.22	0.00	
Frequency of sugar consumption									
Less than daily	1110	26.66	0.006	390	9.72	0.641	0.70	1.73	<0.001
Daily or more often	119	21.08		51	9.13		1.21	2.49	
Toothbrushing frequency									
Twice/day or more	742	24.63	0.011	282	9.70	0.871	0.49	1.32	<0.001
Less than twice/day	487	28.24		159	9.56		1.22	2.43	
Dental attendance									
Check-ups	677	23.97	<0.001	253	9.26	0.300	0.32	0.94	<0.001
Emergencies/ Never	552	28.96		188	10.23		1.41	2.54	
Smoking status									
Non-smoker	887	25.79	0.642	280	8.51	<0.001	0.57	1.40	<0.001
Smoker	342	26.42		161	12.58		1.25	2.60	
Antidepressant medication									
No	1061	23.69	<0.001				0.75	1.83	0.262
Yes	168	66.81					0.89	0.00	
Anxiolytic medication									
No				379	8.64	<0.001	0.75	1.81	0.110
Yes				62	33.13		1.03	2.60	

SEP: Socioeconomic position.

The association of depression and anxiety with dental caries and periodontal disease among Finnish adults

Elsa K. Delgado-Angulo¹, Wael Sabbah², Anna L. Suominen^{3,4,5,6}, Miira M. Vehkalahti^{7,8}, Matti Knuutila⁸, Timo Partonen⁹, Anne Nordblad¹⁰, Aubrey Sheiham¹, Richard G. Watt¹ and Georgios Tsakos¹

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Table 2 Bivariate Relationship between Prevalence, Severity, and the Consumption of Different Beverages and Tooth Wear

Beverage	n*	Overall mean daily frequency of consumption (SE)	Mean daily frequency of consumption (SE)						
			Prevalence			Severity			
			Without TW Score 0	With TW Score 1-3	P-value†	Score 1	Score 2	Score 3	P-value‡
Apple juice	2,925	0.13 (0.01)	0.14 (0.02)	0.13 (0.01)	0.606	0.13 (0.02)	0.09 (0.02)	0.17 (0.07)	0.160
Fruit drinks	2,887	0.31 (0.03)	0.39 (0.05)	0.29 (0.02)	0.046	0.28 (0.03)	0.31 (0.06)	0.35 (0.07)	0.049
Grape juice	2,929	0.08 (0.01)	0.09 (0.01)	0.08 (0.01)	0.371	0.08 (0.01)	0.05 (0.01)	0.05 (0.01)	0.001
Milk	2,912	0.56 (0.03)	0.50 (0.04)	0.58 (0.03)	0.022	0.57 (0.04)	0.59 (0.04)	0.66 (0.09)	0.071
Orange/grapefruit juice	2,919	0.39 (0.02)	0.40 (0.04)	0.38 (0.02)	0.638	0.37 (0.02)	0.43 (0.04)	0.48 (0.11)	0.572
Other juice	2,927	0.16 (0.01)	0.16 (0.02)	0.17 (0.02)	0.898	0.17 (0.02)	0.13 (0.03)	0.22 (0.08)	0.389
Soft drinks	2,745	1.11 (0.07)	1.20 (0.13)	1.08 (0.06)	0.323	1.11 (0.07)	0.95 (0.05)	0.97 (0.12)	0.231
Tomato/vegetable juice	2,917	0.09 (0.01)	0.07 (0.01)	0.09 (0.01)	0.016	0.09 (0.01)	0.07 (0.01)	0.28 (0.04)	0.023

* Number of subjects with reported juice consumption frequency.
 † P-value for t-test comparing the subjects with and without TW.
 ‡ P-value for ANOVA comparing the subjects across severity scores 0-3.

출처 : Okunseri C, Wong MC, Yau DT, et al. (2015) **The relationship between consumption of beverages and tooth wear among adults in the United States.**

Correlation & regression

유의수준 (significance level)

- 관측자료가 우연히 발생할 확률을 의미
- 통계적 유의성을 검정할 때 기준
- 표본 크기가 충분할 경우, 매우 작은 차이도 유의하게 나타남
- “통계적 유의”가 두 변수의 긴밀한 관련성을 나타내거나 임상적 중요성을 의미하지는 않음

Point estimation vs. interval estimation

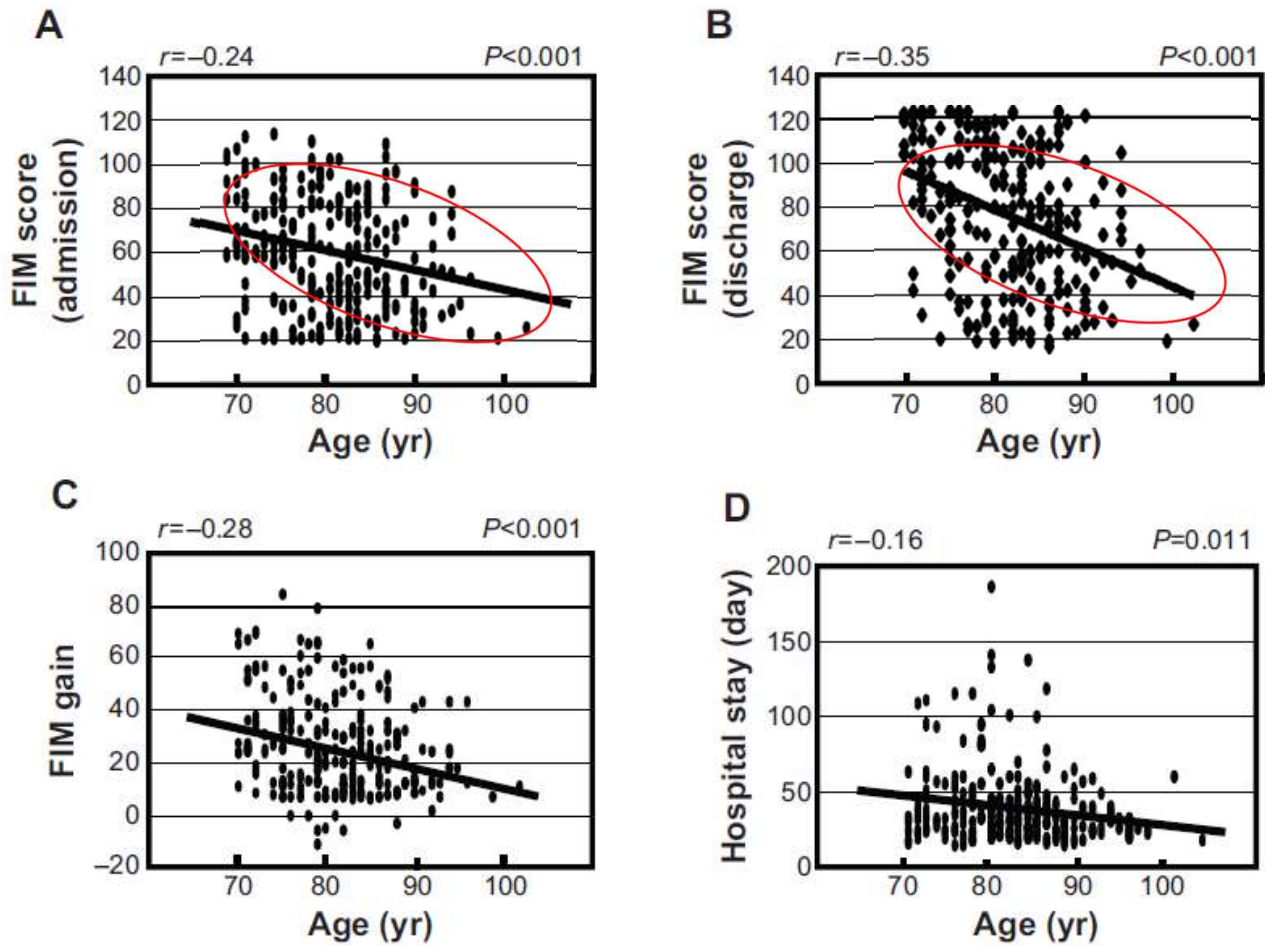
- 점추정 : 모집단으로부터 표본추출, 추출된 표본의 통계량을 이용 모수 추정
- 구간추정
 - 모평균이 존재할 구간을 확률적으로 추정
 - 신뢰구간(confidence interval) : 대표적 방법, 실제 모수가 존재할 것으로 예측되는 구간이라 정의, 90%, 95%, 99%로 신뢰구간 등으로 표현
 - 95% CI란? 신뢰구간 내에 모수가 포함될 확률이 95% 이다!

P-값보다 신뢰구간을 제시하는 것이 더 좋다!

상관계수(r)

- 상관계수 r 은 only 상관 정도만 나타냄
- $r = 1$, x 변수와 y 변수가 서로를 100% 정확하게 설명할 수 있다는 것일 뿐, x 변수가 y 변수에 대해 큰 영향을 미친다고 보기는 어려움

Male



There was a significant negative correlation between FIM score at admission, discharge and FIM gain with age in males (FIM score at admission: $r = -0.24$, $P < 0.001$; FIM score at discharge: $r = -0.35$, $P < 0.001$; FIM gain: $r = -0.28$, $P < 0.001$).

출처 : Nalawade SS, Shinde SK, Pawar RL, et al. (2004). Estimation of dental and facial proportions using height as criteria.

종속변수의 종류에 따른 회귀분석

연속형 변수

- 환자만족도(0-100), 직무만족도(1-10)
DMFT index 등
- 다중 **선형** 회귀분석 (multiple **linear** regression analysis)
- 회귀계수(β) 값과 β 의 P값 or 95% CI

범주형 변수

- 치과의료기관 방문경험(예/아니오),
치아우식증 이환여부(예/아니오) 등
- 다중 **로지스틱** 회귀분석 (multiple **logistic** regression analysis)
- **OR** (또는 **RR**) & it's **95% CI**

선형회귀분석의 기준값은 '기울기'의 기본값인 0 이며,
로지스틱 회귀분석의 기준값은 '배수(倍數)'의 기본값인 1.0 이다.

설명변수 종류에 따른 해석

연속형 변수

- 연령 0-100세
- 다른 변수를 보정한 상태에서 **설명변수가 1단위 증가 또는 감소할 때, 종속변수가 얼마나 변화하는지**로 해석

범주형 변수

- 10대 그룹, 20대 그룹, 30대 그룹
- 다른 변수를 보정한 상태에서 **기준이 되는 설명변수의 범주에 비해 다른 범주의 경우, 종속변수가 얼마나 변화하는지**로 해석

저작불편 호소 여부에 미치는 영향을 확인하기 위해 로지스틱 회귀분석을 수행함.

[Table 4] Logistic regression for receiving governmental support funds by demand for denture

	Crude OR	95% CI	Adjusted OR*	95% CI
Fixed prosthodontics needs	1.12	0.72-1.73	1.22	0.74-2.02
Partial denture needs	2.58	1.83-3.63	2.47	1.71-3.56
Full denture needs	2.80	1.01-7.77	2.06	0.73-5.81

OR, odds ratio; CI, confidence intervals

*Adjusted for gender, age, monthly income, education, economic activity, smoking status, marriage and BMI

- 고정성 가공의치가 필요한 그룹이 필요하지 않은 그룹에 비해 저작불편을 1.12배 더 호소하는 것으로 나타났다.
- 성별, 소득 수준 등 다른 요인을 보정한 후 살펴본 결과 고정성 가공의치가 필요한 그룹이 필요하지 않은 그룹에 비해 1.22배 더 저작 불편을 호소하는 것으로 나타났다.

종속변수 : 범주형
 설명변수 : 범주형? 연속형?

출처 : Kim TH, Jin HJ. (2014) Current chewing difficulty according to dental prosthesis needs in Korean elderly.

Table 3. Unadjusted and adjusted models for the association between wealth index and oral health behaviours with the number of nonreplaced extracted teeth

	Unadjusted CR (CIs)	Model 1 CR (CIs)	Model 2 CR (CIs)	Change in CR (%)
Wealth index				
5th quintile (richest)	1	1	1	
4th quintile	1.10 (0.79; 1.54)	1.22 (0.91; 1.63)	1.17 (0.87; 1.56)	22.7
3rd quintile	1.60 (1.16; 2.22)	1.97 (1.49; 2.59)	1.81 (1.36; 2.40)	16.5
2nd quintile	1.79 (1.29; 2.47)	2.07 (1.58; 2.73)	1.98 (1.50; 2.61)	8.4
1st quintile (poorest)	1.89 (1.36; 2.61)	1.90 (1.45; 2.49)	1.78 (1.35; 2.35)	13.3
Tooth brushing				
Twice a day	1		1	
Less than twice a day	1.38 (1.17; 1.62)		1.23 (1.04; 1.46)	
Dental flossing				
Once a day or more	1		1	
Less than once a day	1.47 (1.24; 1.75)		1.35 (1.12; 1.62)	
Dental visit (last year)				
Yes	1		1	
No	1.16 (1.00; 1.36)		0.89 (0.75; 1.06)	

CR, count ratio; CI, 95% confidence interval.

Model 1: adjusted for age and sex.

Model 2: adjusted for age, sex, tooth brushing frequency, dental flossing frequency and dental visit.

Bold: relationship significant at the 5% level.

종속변수 : 범주형

설명변수 : 범주형

Is the association between socioeconomic status and nonreplaced extracted teeth mediated by dental care behaviours in adults?

Ghorbani Z, Peres KG. Is the association between socioeconomic status and nonreplaced extracted teeth mediated by dental care behaviours in adults? Community Dent Oral Epidemiol 2015; 43: 532-539. © 2015 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd.

- 소득분위 5 집단에 비해, 소득분위 1인 집단이 1.89배 발치 후 치료되지 않은 치아를 가지고 있는 것으로 나타났다.
- 칫솔질을 하루에 2번 이상하는 그룹에 비해 2번 미만으로 하는 그룹이 1.38배 더 치료되지 않은 치아를 가지고 있는 것으로 나타났다.

구강건강실천에 영향을 미치는 스트레스 요인을 파악하기 위해 다중선형회귀분석을 수행함.

Table 5. Influence of Stress on Oral Health Practice

Characteristic	B	SE	b	t	p-value
Home stress	0.018	0.015	0.044	1.147	0.252
Studies stress	0.021	0.015	0.054	1.437	0.151
Peer relationship stress	0.057	0.020	0.111	2.834	0.005**
Appearance stress	-0.019	0.020	-0.040	-0.950	0.342
Material resource stress	-0.052	0.018	-0.122	-2.834	0.005**
$R^2=0.126, F=4.105, p < 0.001$					

SE: standard error.

** $p < 0.01$; statistically significant by multiple linear regression analysis.

구강건강실천에 영향을 주는 요인으로는 교우관계 스트레스 ($B=0.111, p < 0.01$)와 물질 스트레스($B=-0.122, p < 0.01$)가 유의한 변수로 선정되었으며, 모형 설명력은 12.6%였다.

종속변수 : 연속형

설명변수 : 연속형

교우관계 스트레스가 1단위 증가시 구강건강 실천도가 0.111점 유의하게 증가하는 것으로 나타났다.

출처 : Heo AR, Park IS, Song KS (2016). Influence of stress on oral health practice of high school students.

Table 5. Factors Associated with Improvement of Oral Health Knowledge and Attitude

Factor	B	SE	Beta	p-value ^a
Oral health knowledge about use of tooth floss or interdental brush				
Age	0.013	0.015	0.109	0.412
Years of working	0.006	0.016	0.052	0.693
Perceived oral health status ^b	0.095	0.101	0.096	0.353
Concern for oral health ^b	-0.216	0.087	-0.257	0.015
Oral health knowledge about regular oral examination				
Age	0.017	0.018	0.123	0.335
Years of working	0.019	0.018	0.137	0.286
Perceived oral health status	-0.063	0.116	-0.054	0.590
Concern for oral health	-0.326	0.100	-0.326	0.002
Oral health knowledge about regular scaling				
Age	-2.978E-5	0.015	0	0.998
Years of working	0.008	0.015	0.065	0.614
Perceived oral health status	0.060	0.099	0.061	0.543
Concern for oral health	-0.310	0.085	-0.368	<0.001
Oral health attitude about prevention of caries or periodontal disease				
Age	0.006	0.013	0.053	0.639
Years of working	0.026	0.014	0.214	0.061
Perceived oral health status	-0.007	0.089	-0.007	0.938
Concern for oral health	-0.496	0.076	-0.576	<0.001
Oral health attitude about use of tooth floss or interdental brush				
Age	-0.027	0.017	-0.200	0.125
Years of working	0.026	0.018	0.188	0.148
Perceived oral health status	0.031	0.113	0.028	0.783
Concern for oral health	-0.319	0.099	-0.326	0.002
Oral health attitude about regular examination including national screening				
Age	0.014	0.019	0.092	0.458
Years of working	0.007	0.019	0.043	0.728
Perceived oral health status	-0.002	0.125	-0.002	0.987
Concern for oral health	-0.483	0.107	-0.438	<0.001

종속변수 : 연속형
 설명변수 : 연속형

SE, standard error.
^aDetermined by linear regression analysis.
^bCalculated using Likert scale 1-5.

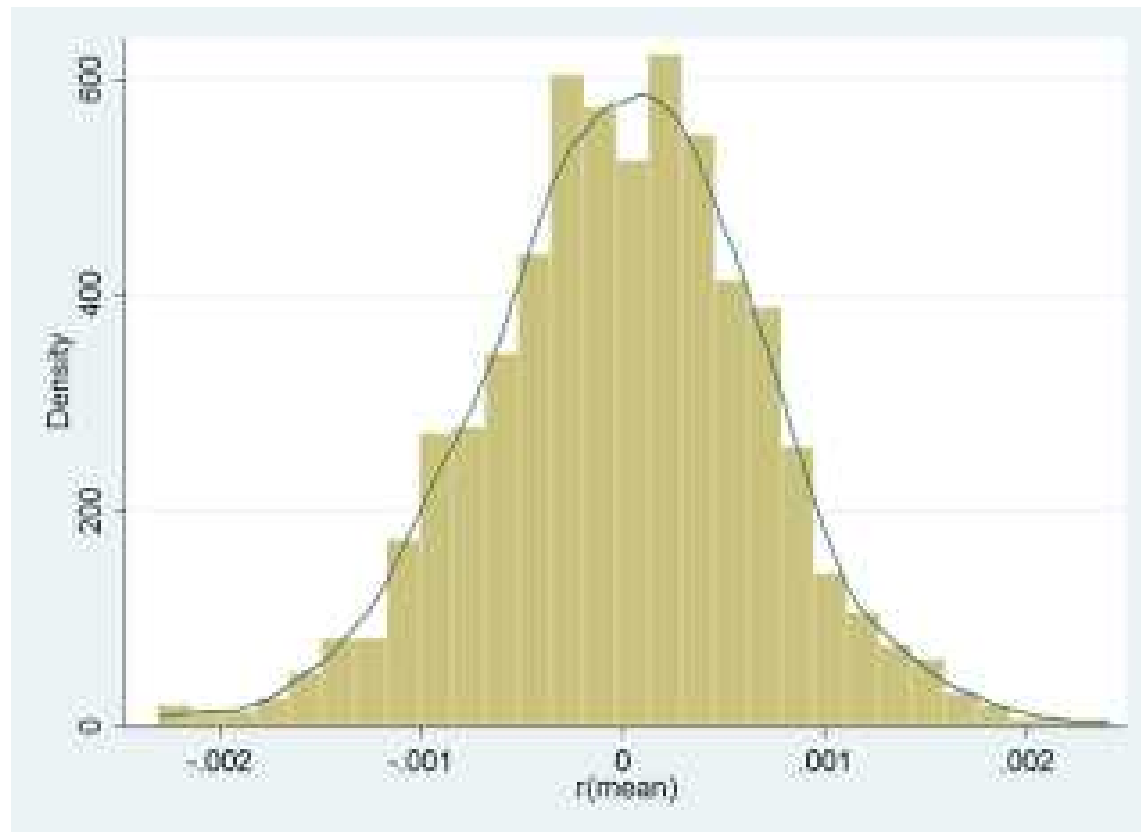
출처 : Lee HJ, Paik DI. (2016). Effects of oral health education for occupational health nurses.

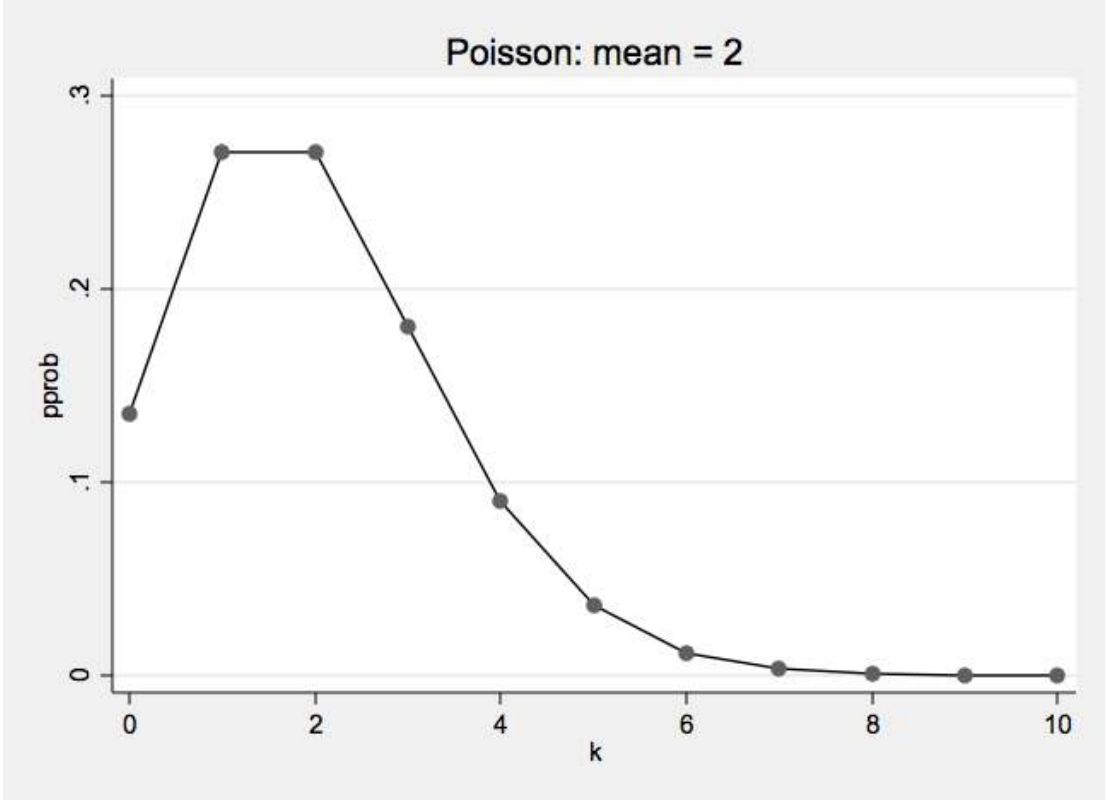
Estimates of effect size

- 독자에게 raw results를 제시하지 않고, 의미 있는 측정 기준으로 제시
- Effect size, odds ratio, relative risk, risk difference 등의 적절한 측정값으로 변형해서 제시
- 설명변수는 단순히 한 단위 증가가 아닌 의미 있는 단위 변화량에 대한 effect size 제시

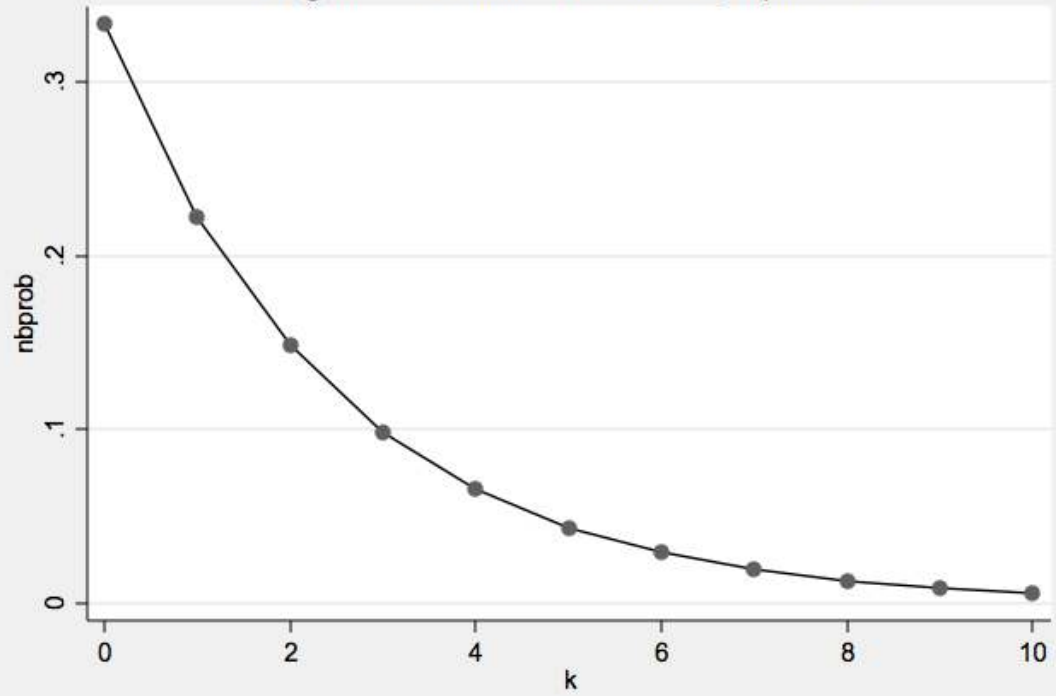
출처 : Annals of internal medicine. (2005). Writing and reviewing for medical journals.

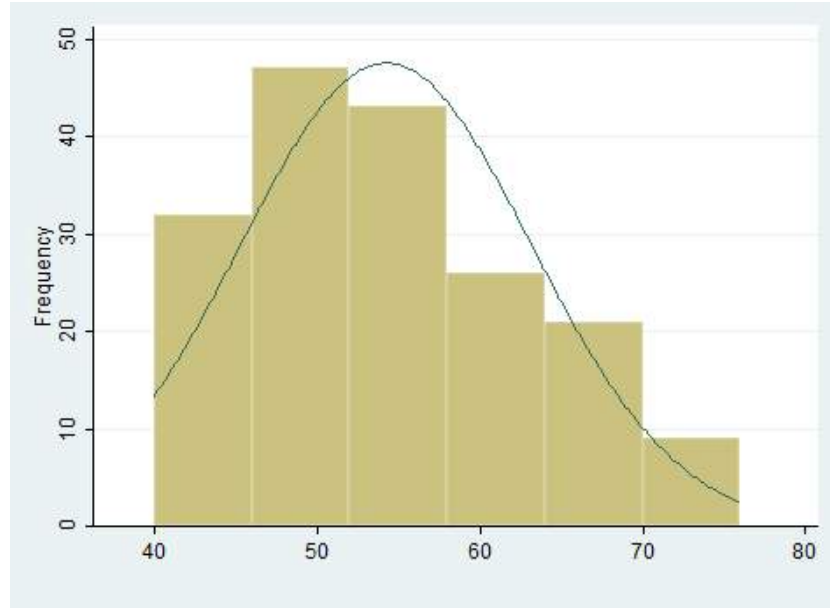
Variety type of regression ?





Negative binomial: mean = 2, alpha = 1





Variety type of regression ?

- 자료의 특성과 분포를 고려한 다양한 회귀분석
 - count data analysis (poisson, negative binominal regression, zero inflated negative binominal regression)
 - truncated regression (tobit model)
 - nominal logistic regression

참고문헌

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감사합니다!!