On the use of Count Model to Predict Falls in Community-Dwelling Elderly
:Using KLoSA (Korean Longitudinal Study of Ageing) Data

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Background

Falls has been caused of increasing rates of morbidity or mortality in elderly population (Centers for Disease Control and Prevention, 2013). In community-dwelling adults aged 65 years or older, one in three in the US (Kannus et al., 2007) and 17.2% of South Korean (Korea Ministry of Health and Welfare, 2009) suffers a fall each year. It's been led to spend of much of budgets from medical finance. And, the severity of complications of fall accidents has increased the length of stay of the old in hospital or care facility (Donaldson et al, 2005). Even though many of studies have been proposed the predictors or solutions for fall prevention, falls are still methodological issues in geriatric nursing field. This study suggests predicting the causes of increasing fall accidents in elderly by analyzing the national data with count model.
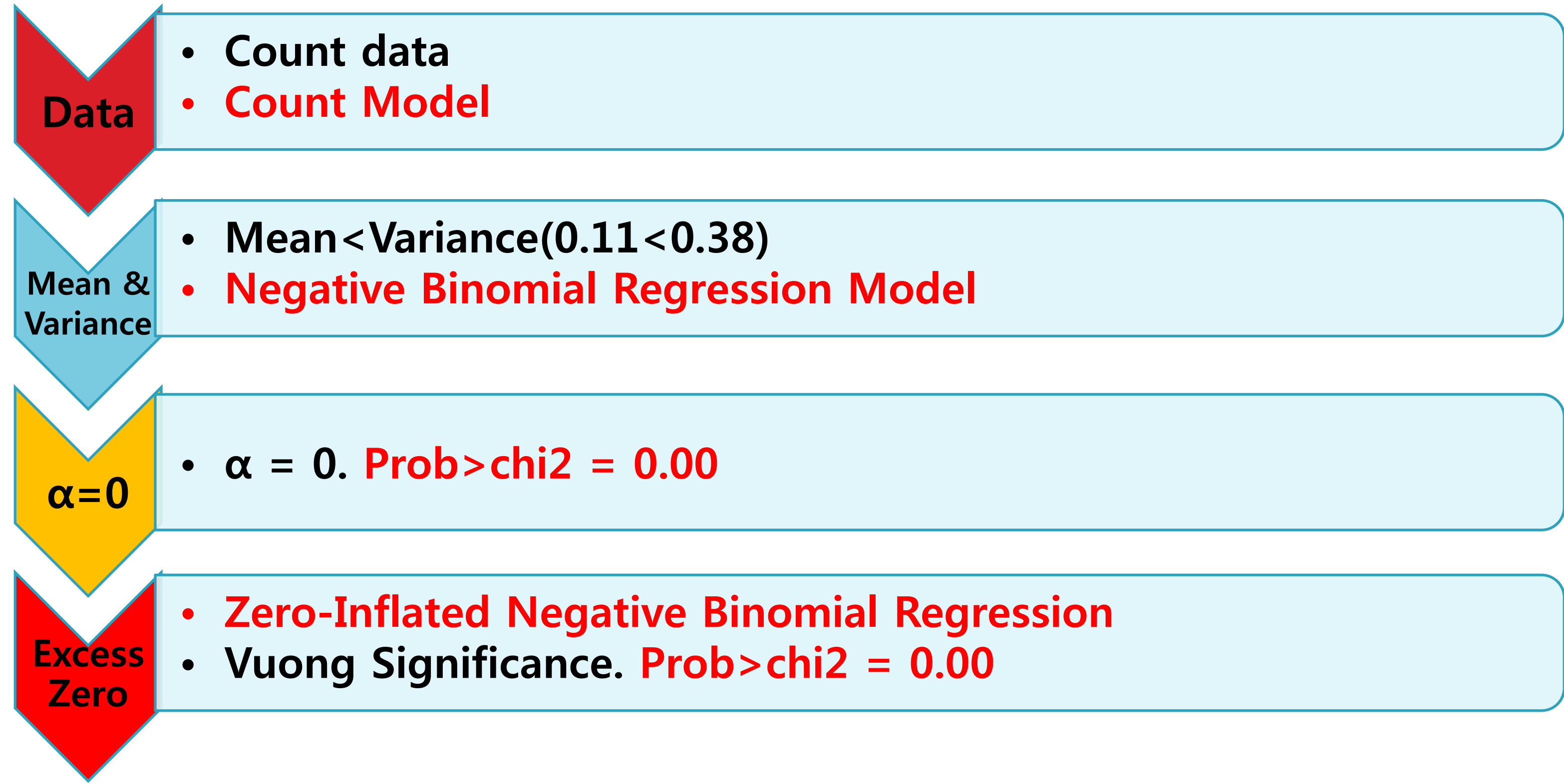
Purpose

The objectives of the study were: (1) to ascertain the risk factors for falls in community-dwelling elderly; (2) to determine whether risk factor profiles differ between first time fallers and recurrent fallers; and (3) to build decision tree map of fall down risks in elderly and to suggest effective interventions for first time fallers and recurrent fallers each.
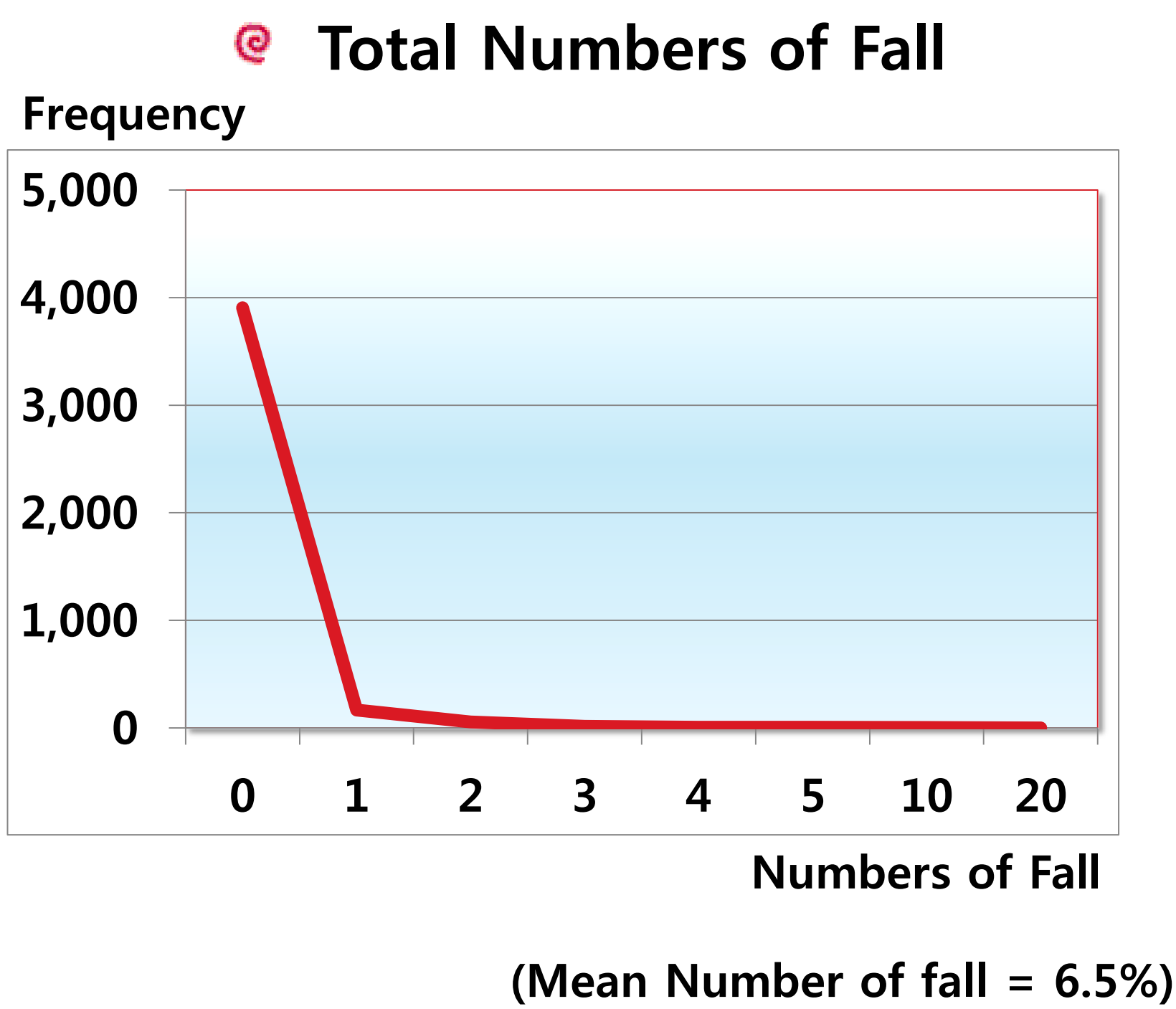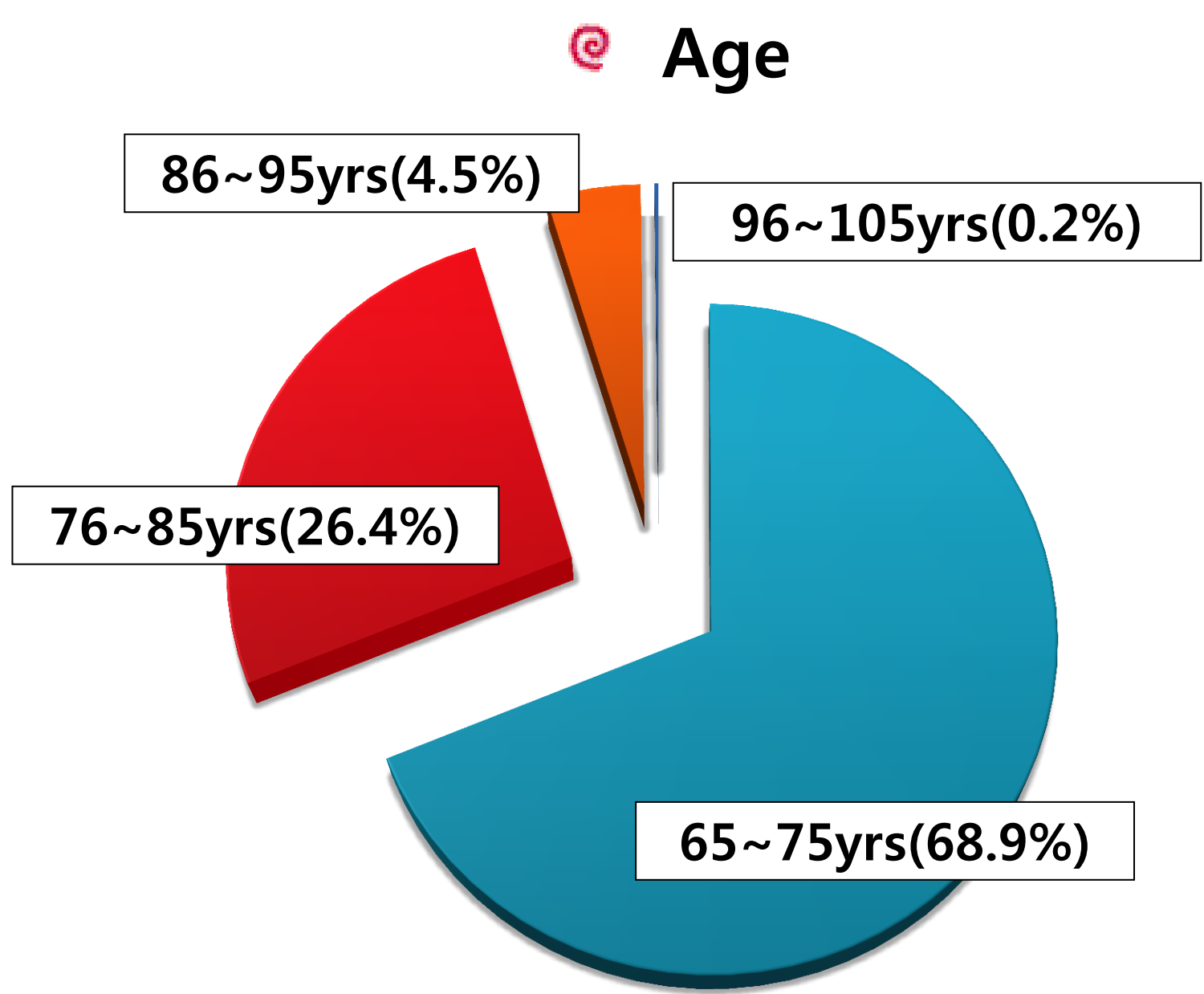
Methods

■ Design: Secondary Data Analysis
■ Subjects : 4163 Elderly Men and Women, More than 65 years old in Korea
      Used Data of Korean Longitudinal Study of Ageing(KLoSA)
■ Period of Data collection: June 2006 ~ December 2006
■ Count Models were estimated using STATA ver 10.0 Regression Tree with rpart/RProgram

Data analysis Procedure

Data
- Count data
- Count Model

Mean & Variance
- Mean<Variance(0.11<0.38)
- Negative Binomial Regression Model

α=0
- α = 0. Prob>chi2 = 0.00

Excess Zero
- Zero-Inflated Negative Binomial Regression
- Vuong Significance. Prob>chi2 = 0.00

Results

1. General Characteristics (N=4163)

@ Age
86~95yrs(4.5%)
96~105yrs(0.2%)
76~85yrs(26.4%)
65~75yrs(68.9%)

@ Total Numbers of Fall
Frequency
Numbers of Fall
(Mean Number of fall = 6.5%)

2. Significance of Variables (N=4163)

Characteristics	Classification	N(%)/P	Characteristics	Classification	N(%)/P
Region	Large city	1751 (42.1)*	Pain	Yes	928 (22.3)**
	City	1209 (29.1)		No	3235 (77.7)
	Community	1203 (28.9)	Alcohol	Yes	1142 (27.4)*
Religion	yes	2273 (54.6)**		No	3021 (72.6)
	no	1890 (45.4)	Depression	Yes	1839 (44.2)*
Vision	Very good	16 (0.4)**	(CES-D10)	No	2292 (55.1)
	Good	756 (18.2)	Fear of falls	Never worried	1220 (29.3)**
	Normal	1866 (44.9)			
	Bad	1332 (32.0)		Worried	1883 (45.2)
	Very bad	186 (4.5)		Always worried	1060 (25.5)

3. Correlation between Significant Variables (N=3381)

	Numbers of Falls	Vision	Height	Weight	QoL	ADL	Social Activity
Numbers of Falls	1	.062**	-.040*	-.040*	-.056**	.045**	-.035*
Vision		1	-.134**	-.128**	-.226**	.135**	-.114**
Height			1	.574**	.098**	-.002	.136**
Weight				1	.103**	-.071**	.158**
QoL					1	-.208**	.209**
ADL						1	-.182**
Social Activity							1

*p<.05 **p<.001

4. Regression used Enter Method (N=4163)

Variables		β	t-value	P	C.I.
Constant		-.310	-.596	.552	-1.331 .711
Gender (Based on female)	Male	-.072	-2.095	.036*	-.139 -.005
Alcohol (Based on no drink)	Drink	.067	2.570	.010*	.016.118
Fear for falls (Based on never worried)	Worried	.030	1.163	.245	-.021.080
	Always Worried	.250	7.459	.000*	.184.315

fear of falls *p* value : .000 R^2 = .218

*p<.05

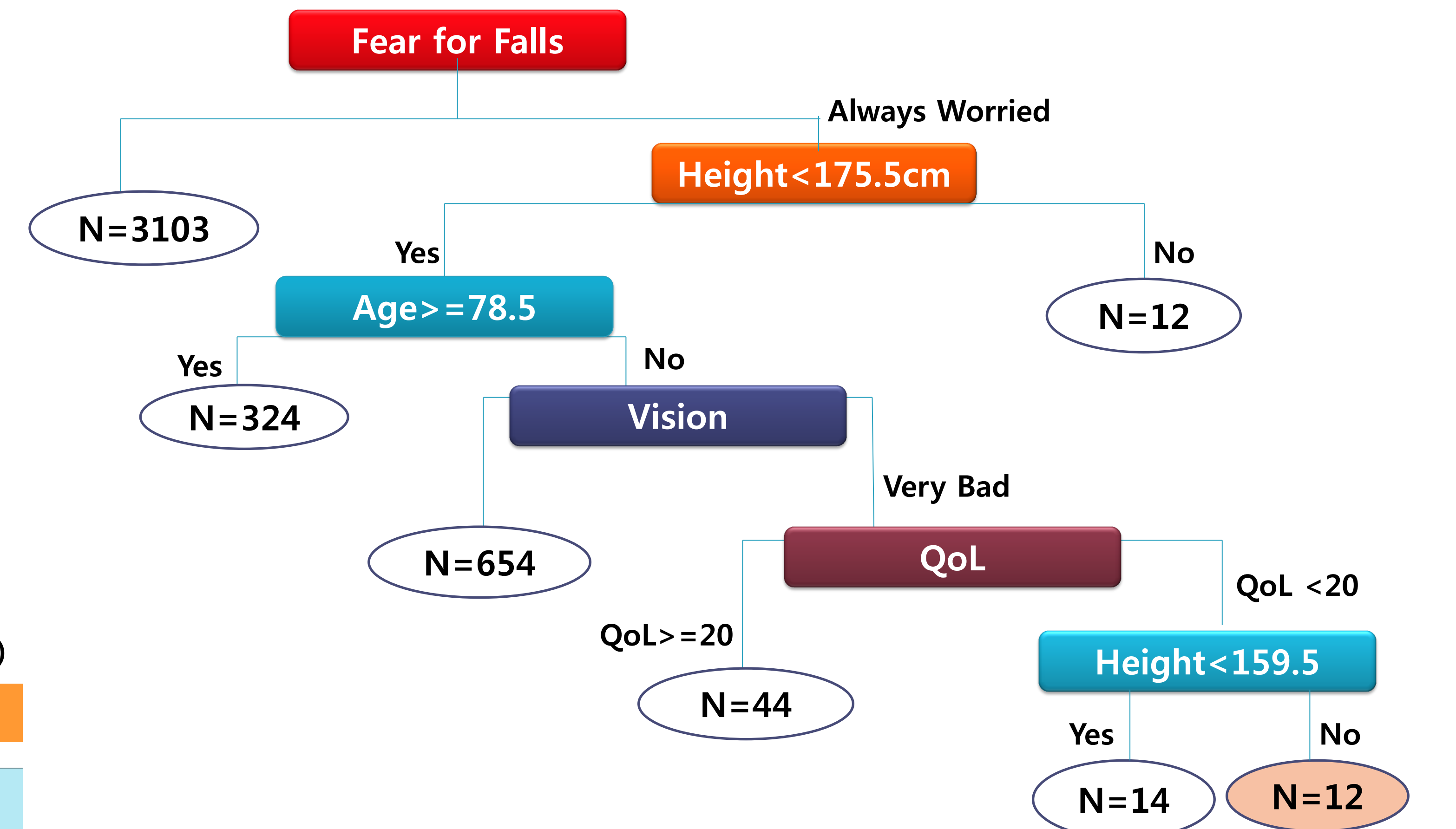### 5. Zero-inflated Negative Binomial Regression (N=3881)

Variables	Negative Binomial Regression Model			Zero-Inflated Negative Binomial Regression Model					
						inflate			
	Coefficient	SD	P	Coefficient	SD	p	Coefficient	SD	p
Vision	.05	.10		.23	.13		.33	.16	*
Religion	.38	.17	*	.12	.26		-.41	.29	
Residence	-.09	.10		.36	.15	*	.54	.19	*
Alcohol	.35	.19		.70	.27	*	.41	.32	
Pain	-.46	.26		.47	.44		1.01	.46	*
Depression	.13	.17		-.38	.25		-.64	.32	*
Fear of fall	1.48	.14	*	1.11	.26	*	-.51	.30	

Likelihood-ratio test of α=0: 0.00   Vuong test of zinb vs. standard negative
Prob>chi2 = 0.0000 Pseudo R^2 = 0.10   binomial: 0.002   Prob>chi2 = 0.0000

*p<.05

6. Decision Tree Map (N=4163)

Fear for Falls
Always Worried
Height<175.5cm
N=3103
Yes   No
Age>=78.5   N=12
Yes   No
N=324   Vision
N=654   Very Bad
QoL
QoL>=20   QoL <20
N=44   Height<159.5
Yes   No
N=14   N=12

Conclusion & Nursing Implications

These results provide new points of view of nursing implication for fall prevention of elderly in Korea. Significant predictors of being a non-faller or faller were a vision, residence, pain and depression. And significant predictors of being a recurrent faller were a residence, alcohol and fear of falls. For diagnosis and predicting recurrent fallers regression trees were as follows : fear of falls, height, age, vision, QoL(characteristics of high risk group). Thus, we should pay special attention for causes of fall to faller and non-faller. This secondary-analysis provides comprehensive evidence-based assessment of risk factors for falls and recurrent falls in older people, confirming their multifactor etiology. The findings of this study will be the basis for effective intervention program to prevent falls and repeat falls.