

International Earthquake Conference
Los Angeles
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**Session 1C: Disaster Risk Reduction through Land
Use Planning**

*“Risk Management, Social Participation and Urban
Planning in Mexico City”*

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Research Objectives

- To define the degree of correlation between urban land use, structural and social vulnerability to seismic risk in Mexico City.
- To assess the level of awareness and risk perception of the population.
- To assess, directly and indirectly, the State policies after the 1985 earthquake and to define the preconditions, tools and actions necessary to build a Culture of Prevention.
- To assess the role of the Media in the construction process of risk representation systems.

Hypothesis:

- A successful Risk Management and Culture of Prevention Policy depends on a high correlation between Objective and Subjective Risk and on people's Knowledge Appropriation, Awareness and Participation.
- In the case of Mexico City, there is not correlation between Awareness and Risk Perception of the Population (Subjective Risk), and the built, infrastructural and geological vulnerability (Objective Risk).

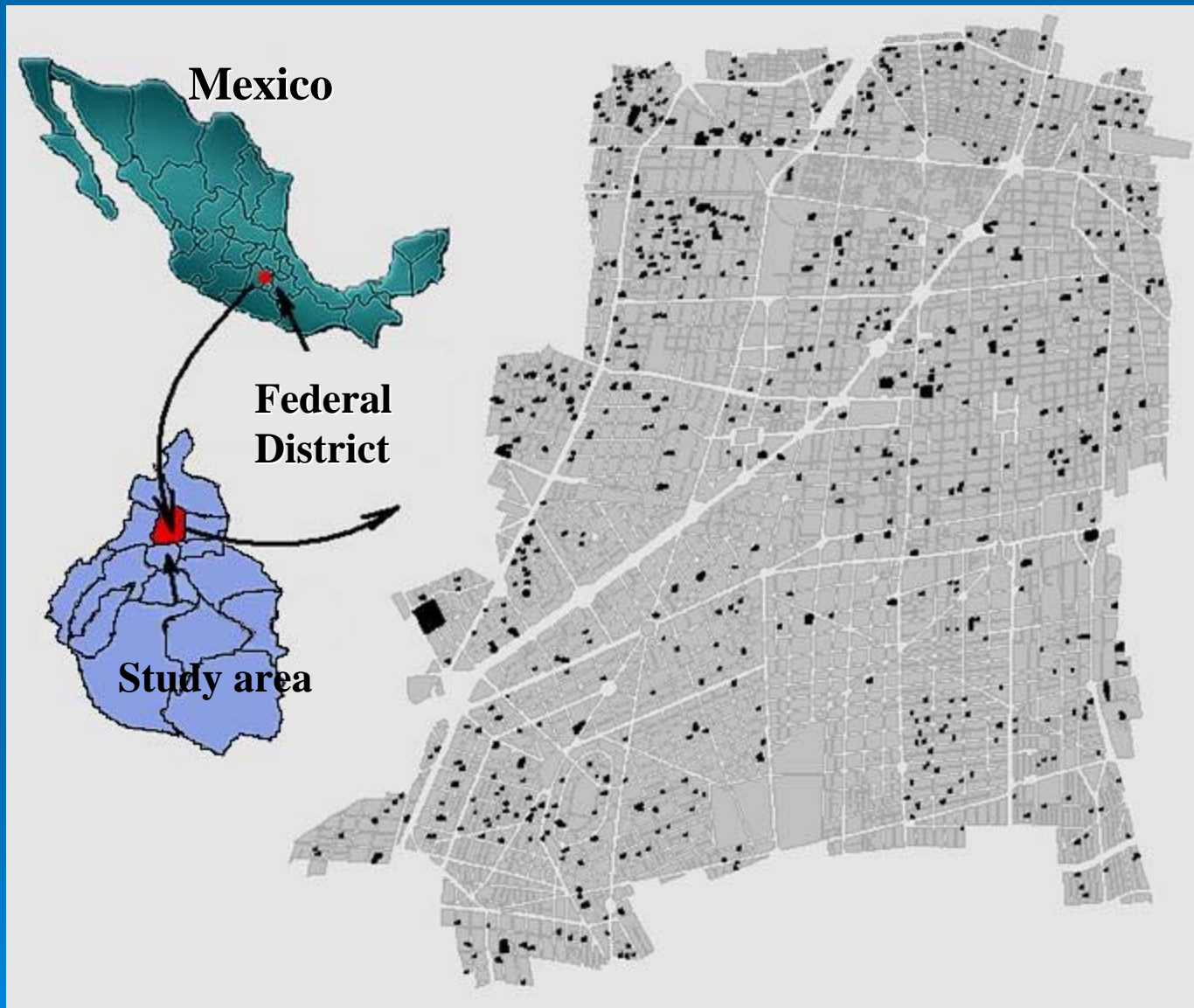
$$\text{Risk} = \text{Hazards} / \text{Vulnerability}$$

(seismic) (socio-economic – structural and geological)

$$\text{Society (City) - Nature (Environment)}$$

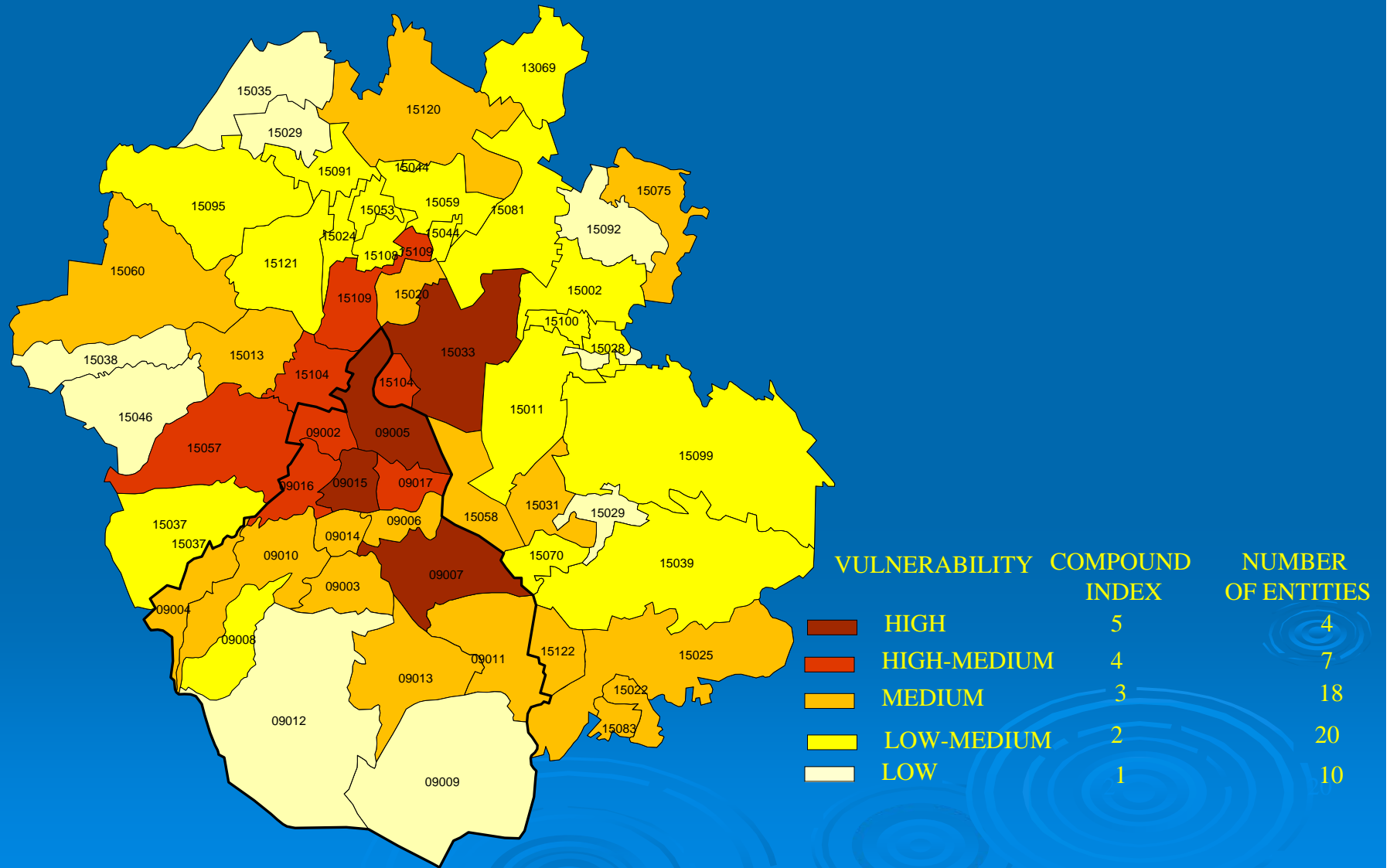
(Vulnerability) (Vulnerability)

Case Study Area



Spatial distribution of sampled structures

GENERAL COMPOUND INDEX OF VULNERABILITY OF THE MEGA-CITY OF MEXICO, 1990-1995



Case Study

Mexico City's Historical Center

(Delegación Cuauhtémoc)

Total population of the area (2005):

521,348 inhabitants

Men: **245,697**

Women: **275,651**

Surface: **32.44 Km²**



2.2 % of Mexico City area

Density: **16 071.14 people per Km²**

Features of the area:

- **34 neighborhoods, 2 archeological sites**
- **1, 500 buildings are classified as National Heritage: 86 % private and 14% public**

Objective Risk Calculation*

* The formal building loss calculation was conducted with the Mexico's Seismic Risk Method (RSMex).

Universe of Buildings Examined



Location of structures visited

Variables considered in the determination of Seismic Risk:

- Number of floors (height)
- Years of construction
- Use
- Soil characteristics

Seismic Zone	Year of construction					
	≤ 1957		1958-1985		> 1985	
	Number of floors					
	≤ 5	> 5	≤ 5	> 5	≤ 5	> 5
Ts ≤ 1.5						
Ts > 1.5			Housing			
Ts ≤ 1.5						
Ts > 1.5			No Housing			

Complementary variables:

- Structural irregularity plan and elevation
- Probability to slam
- Others use
- Overweight

Total housing units in each sample stratum

Age		<57		57 – 85		> 85		Total
Soil type	No. floors	≤ 5	> 5	≤ 5	> 5	≤ 5	> 5	
< 1.5	Housing	5,876	196	3,675	338	1,620	30	11,735
	No. housing	1,019	35	982	195	496	36	2,763
> 1.5	Housing	10,122	445	11,675	795	4,794	167	27,998
	No. housing	2,800	270	4,358	670	2,548	386	11,032
							Total	53,528

Sample sizes in each stratum

Age		<57		57 – 85		> 85		Total
Soil type	No. floors	≤ 5	> 5	≤ 5	> 5	≤ 5	> 5	
< 1.5	Housing	111	7	112	4	107	6	347
	No. housing	37	3	38	3	36	3	120
> 1.5	Housing	113	7	112	7	110	7	356
	No. housing	38	2	38	3	38	3	122
							Total	945

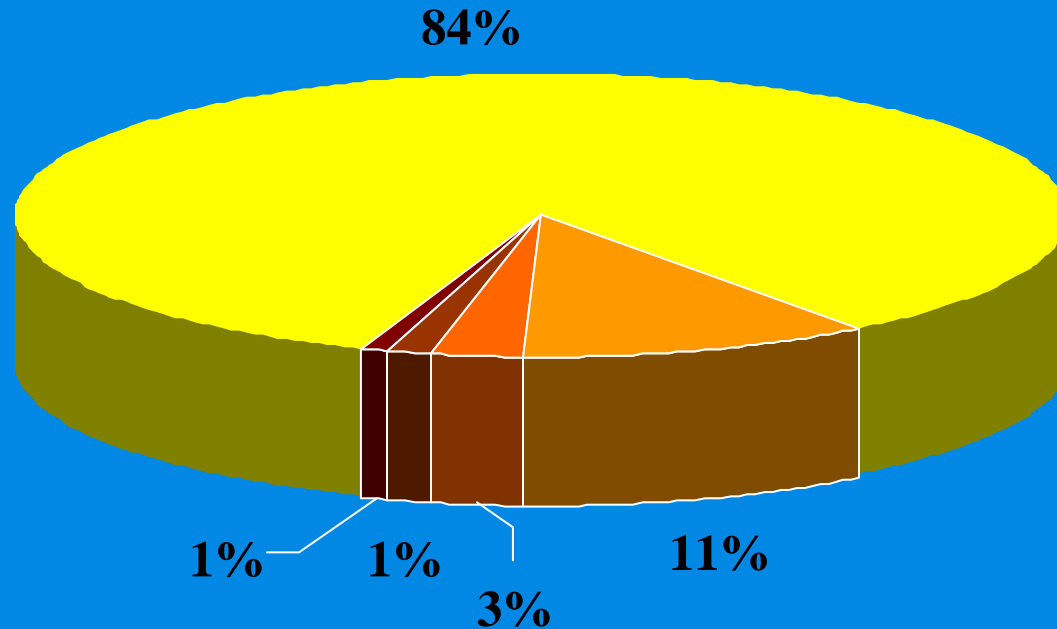
Subjective Risk (Perception of Seismic Hazard)

Sample Modules

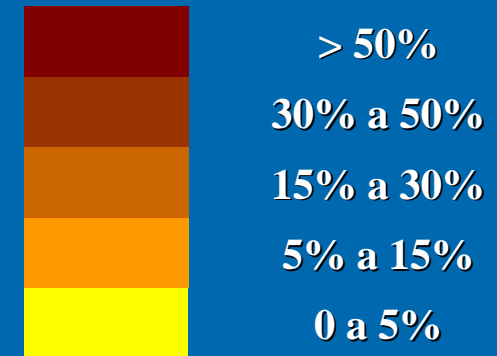
Socio-economic
Risk Perception
Social Organization
Institutional Interaction
Mitigation and Prevention Measures

Results

Percentage of Buildings Damaged



% of Loss RSMEX



■ Very Low ■ Low ■ Half ■ High ■ Very High

1% of loss very high = 545 buildings

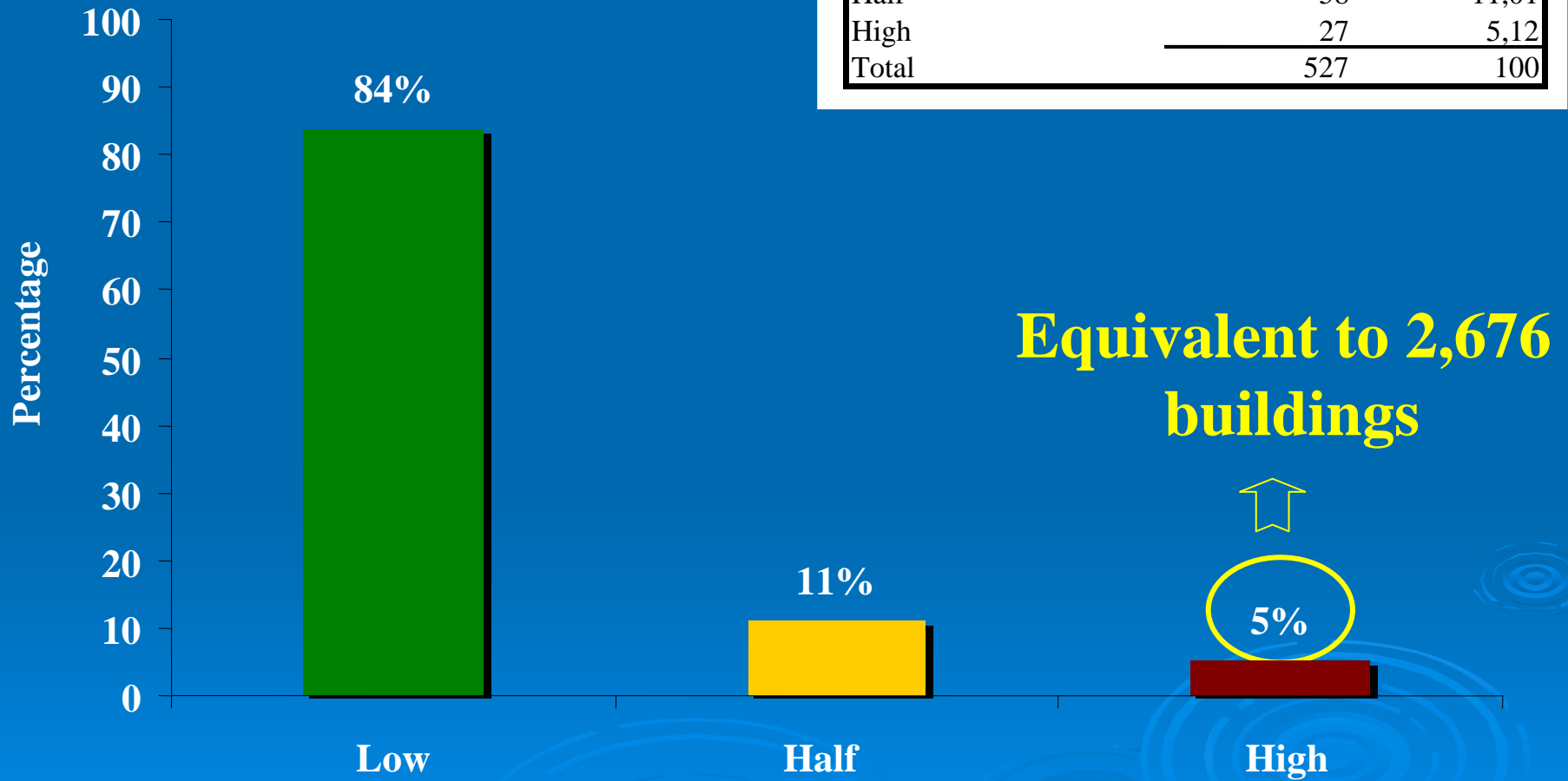
1 % of loss high = 545 buildings

3 % of loss half = 1586 buildings

This implies that 2676 buildings are ranked within the range of half and very high damaged

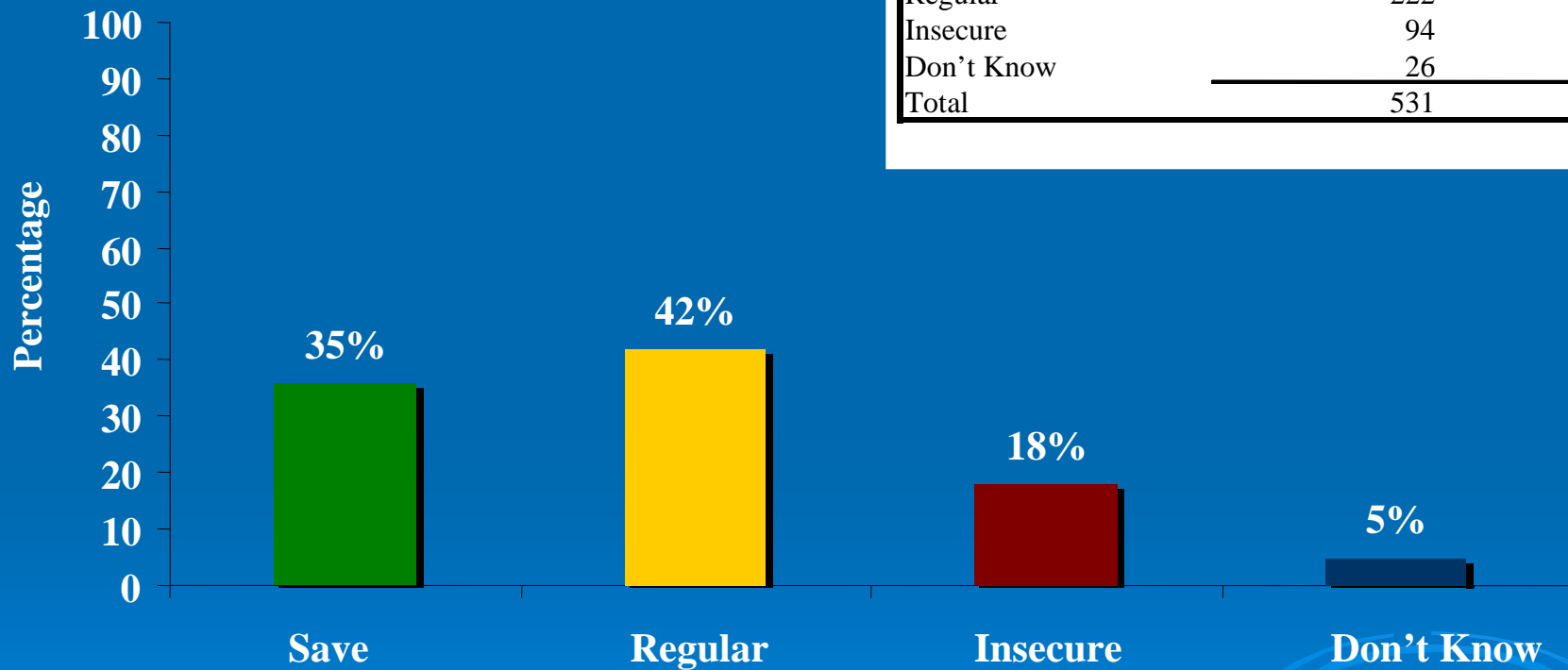
Calculated Objective Risk

Calculated Risk		
	Frequency	Percentage
Low	442	83,87
Half	58	11,01
High	27	5,12
Total	527	100



Subjective Risk (Risk Perception)

Perceived Risk		
	Frequency	Percentage
Save	189	35,59
Regular	222	41,81
Insecure	94	17,70
Don't Know	26	4,90
Total	531	100



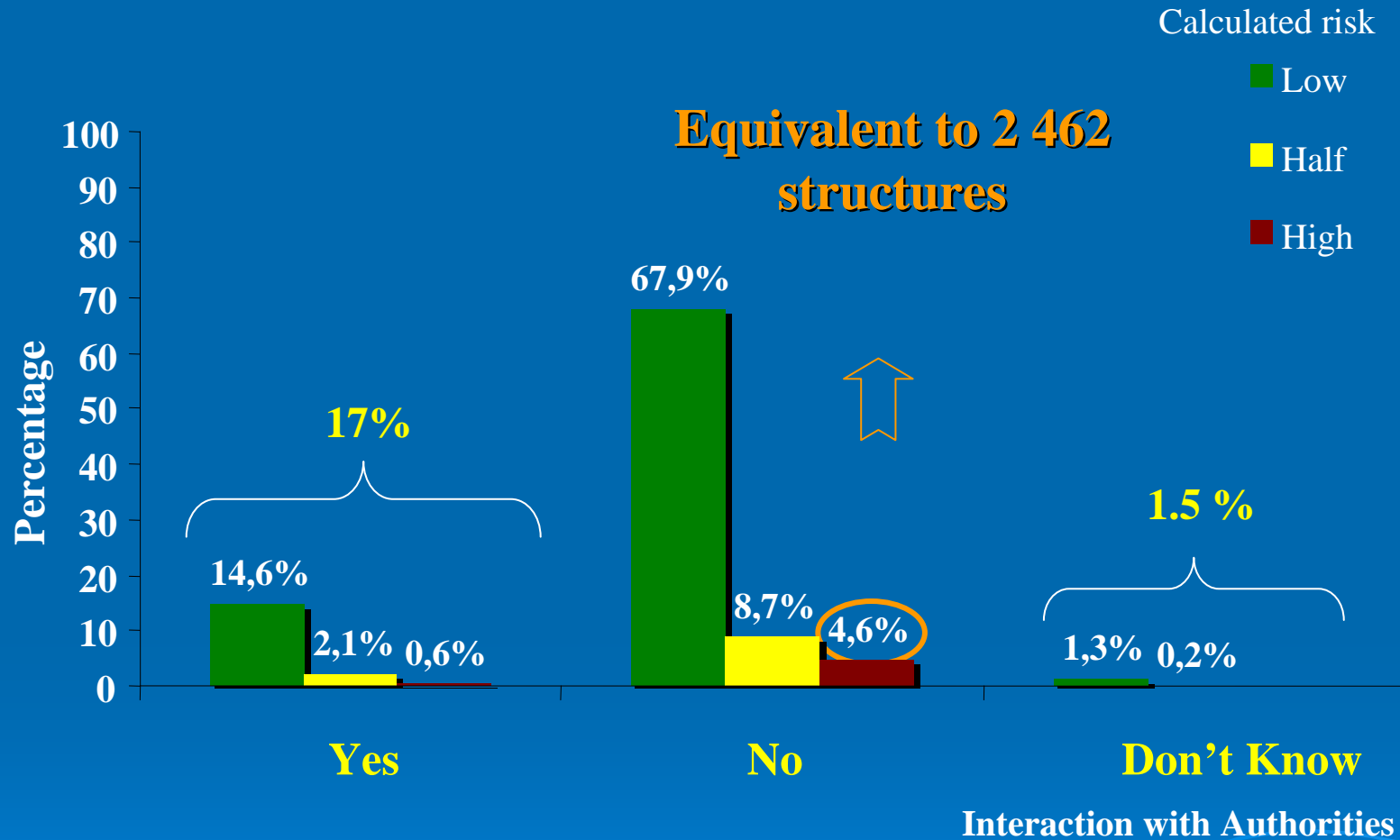
Subjective risk was defined in relation to people's perception of housing resistance to an earthquake similar to that Mexico City's 1985.

Objective and Subjective Risk Correlation

Calculated Risk	Risk Perception			Total (Percentage)
	Low	Half	High	
Low	17,5	41,0	25,4	83,9
Half	2,7	6,3	2,1	11,0
High	0,9	2,8	1,3	5,1
Total	21,1	50,1	28,8	100

Correlation= 25 %

Community Interaction with Local Authorities (Demands to Retrofit Buildings)



Only 17% of the population have contacted local authorities, and 0.6% tenants of classified high risk buildings.

Conclusiones

- There is a **low correlation between objective and subjective risk**:
 - Overestimation of 68%,
 - **Correlation 25%**
 - Underestimation of 6 %
- **There is not correlation between education and socio-economic variables with risk perception.**
- The results demand a **Risk Awareness Policy**, in order to reinforce **the Principal of Co-responsibility** with Local Authorities.

- **Risk and vulnerability** dimensions should be the backbone **of Urban Development Plans.**
- **It's imperative to solve the endemic problem of the Urban Planning and Risk Management:**
 - The gap between the Normative Rationality of Planning.
and
 - The Social Process of Production and Reproduction of the Urban Built Environment.
- **A compulsory implementation of Urban Development Plans is needed.**
- The role of the **Media** is fundamental for the dissemination and development of a Culture of Prevention.
- **Risk Management** should taken as a corner stone of **economic development** (**Ulrich Beck**).

Thank you