6th International NIR Workshop of ICNIRP

Session 5 - The Latin American Approach
17 October 2008

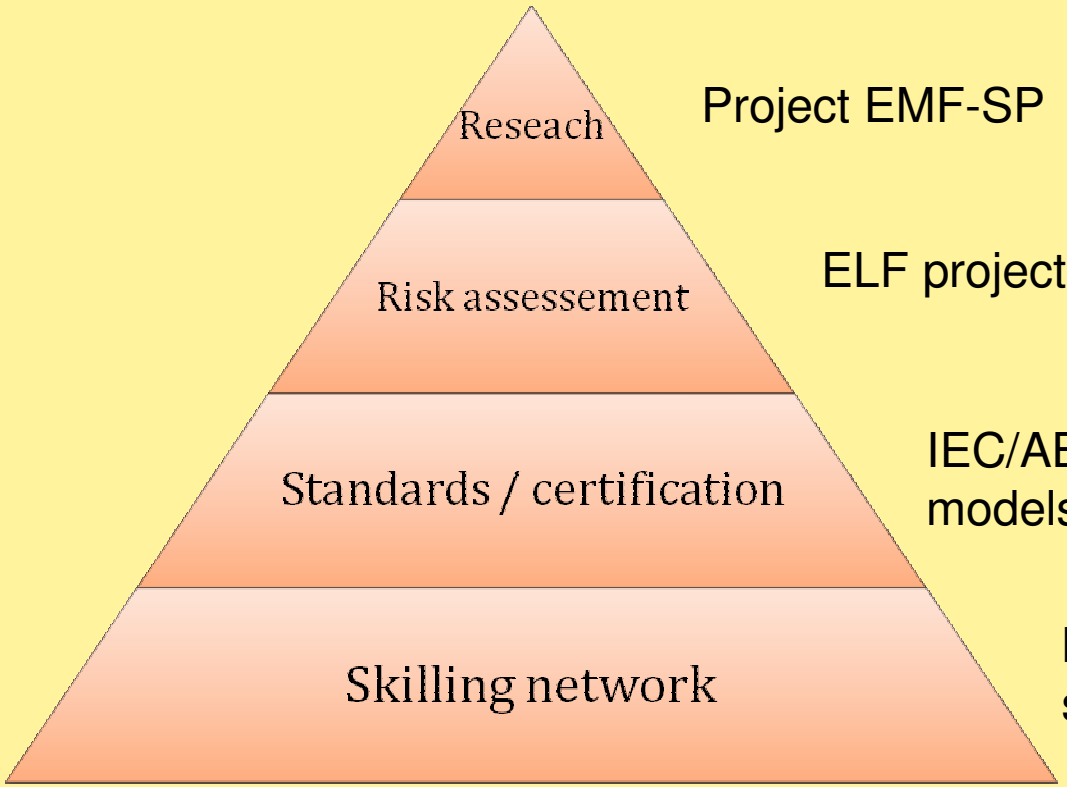
"Project EMF-SP"

Flávio Eitor Barbieri, PhD

Project Manager
Technical Director

EMF-SP Project background

ABRICEM – 20 years :
exemption, pioneering, integration, management, application



Project EMF-SP

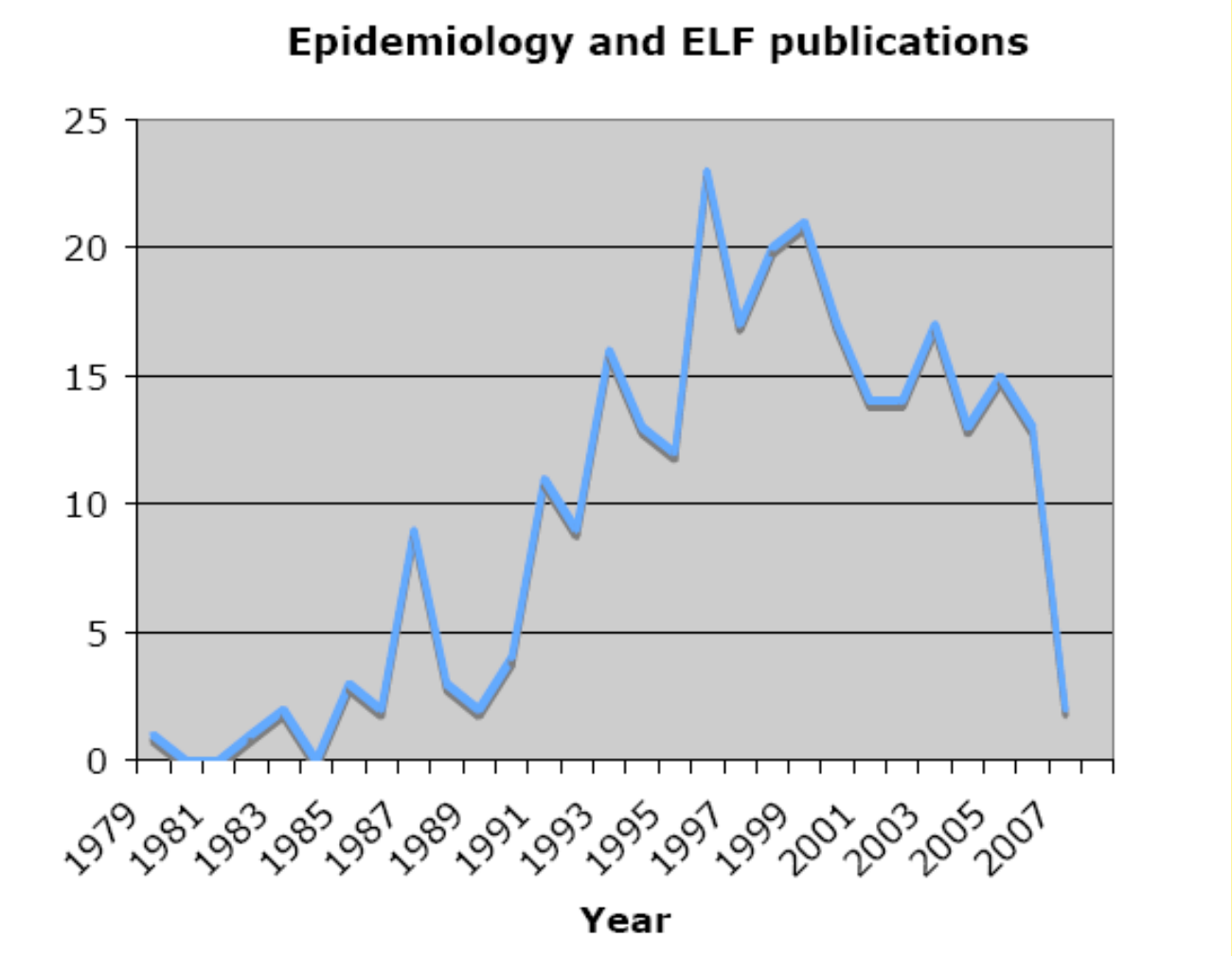
ELF projects

IEC/ABNT – RF/ ICNIRP (Anatel303)
models / practices

Multidisciplinaire
study groups

Abricem

Research Evolution



Abricem

Why a new research

- Epidemiologic studies about health effects of environment stress agents are, though not conclusive, an indispensable tool to detect evidence of causal associations, which can identify opportunities for searching explanations and testing hypotheses through confined under controlled conditions and eventually focused on biological mechanisms.
- The strength of epidemiological study is, unlike the other researches, to do scientific observations on the performance of the health bodies under local conditions of normal life.
- The life conditions in our country is differentiated relative to other countries.
- So you cannot just transplant results of epidemiological studies from other countries for our local conditions may create other configurations of causes and effects.
- This uncertainty could suggest to do our own research.
- Better yet if we use international scientific protocols and can provide results comparable and with greater certainty and property.
- Moreover, if our investigations and results are sufficiently visible and understandable by the population that is more interested in the implications.

Abricem

Project EMF-SP purpose

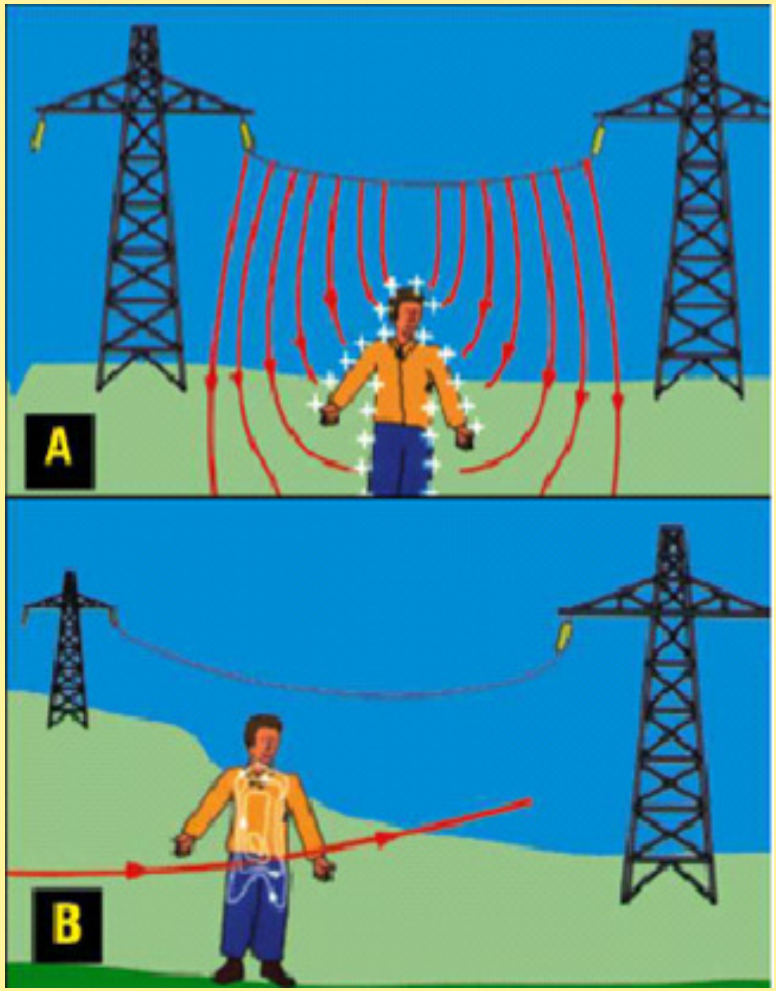
- Not one more academic and isolated research.
- A possible reference project in Brasil and even in South America.

Abricem

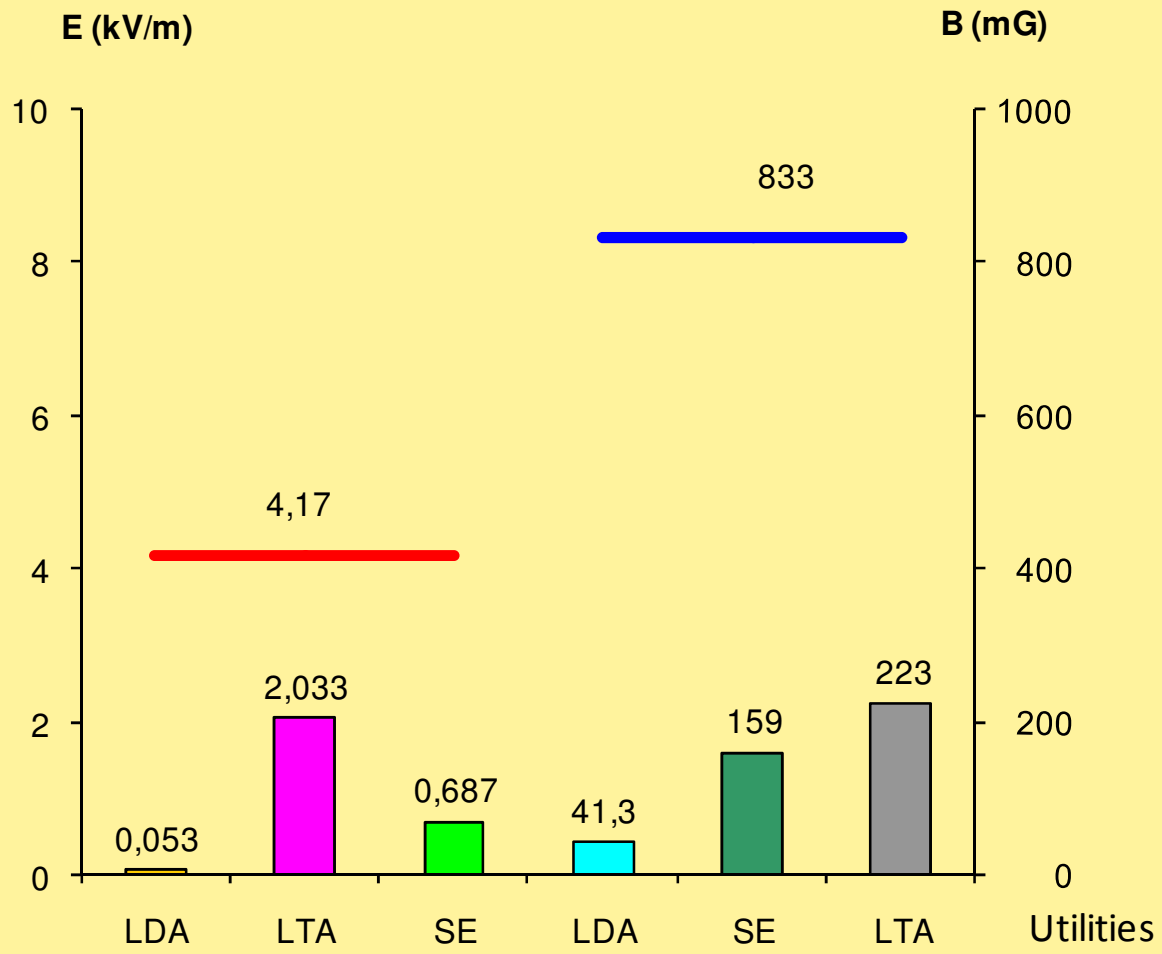
Introduction

- The project EMF-SP involves epidemiologic, exposure assessment and risk perception studies in the State of São Paulo.
- These studies are designed to evaluate possible effects of ELF on general populations and in the occupational setting.
- It is expected that the project will acquire too unique data about ELF exposures in the Brazilian population not available now.

ELF Exposure



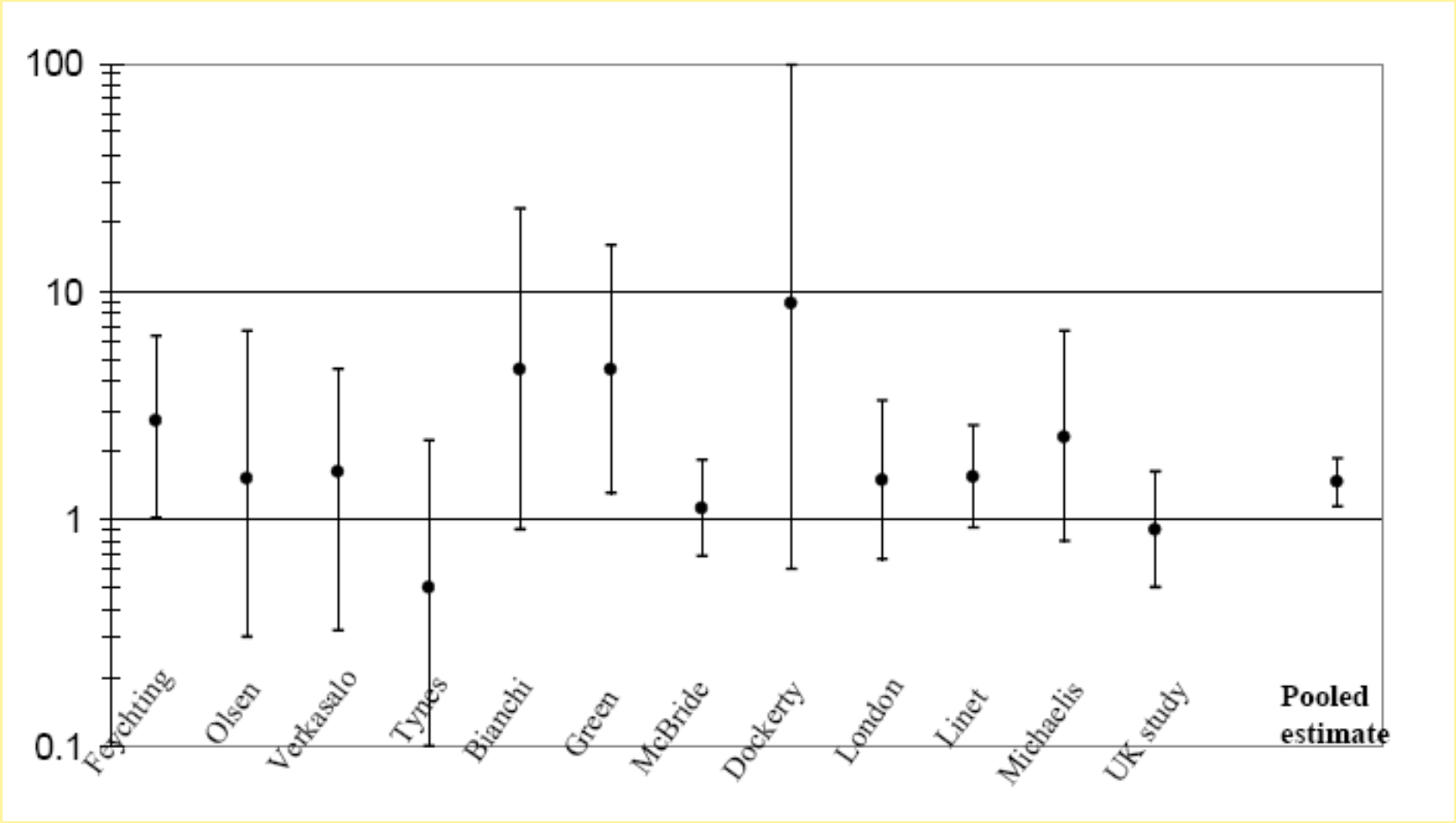
Power Utilities SP/ WHO-ICNIRP Limits



SCIENTIFIC EVIDENCE

- According to WHO below the ICNIRP limits there is still no enough scientific evidence to conclude that ELF exposure presents risk to health.
- Although some studies indicate link to childhood leukemia, further research is needed

Childish Leukemia and Magnetic Fields



IARC Classification

confirmed by WHO ELF-EHC Monograph No. 238. 2007 Jun.

IARC. Static and Extremely Low-Frequency Electric and Magnetic Fields. Vol. 80 (19–26 June 2001)

ELF magnetic fields

- Limited evidence in humans
  - Childhood leukemia
- Inadequate evidence in animals

Group 2B: Possibly carcinogenic to humans

What To Do When The Evidence is Not Strong?

- Understand and weigh the data
  - risk assessment
- Get better data, reduce uncertainty
  - research
- Understand and manage perception
  - risk communication
- Build a rational framework for precautionary measures

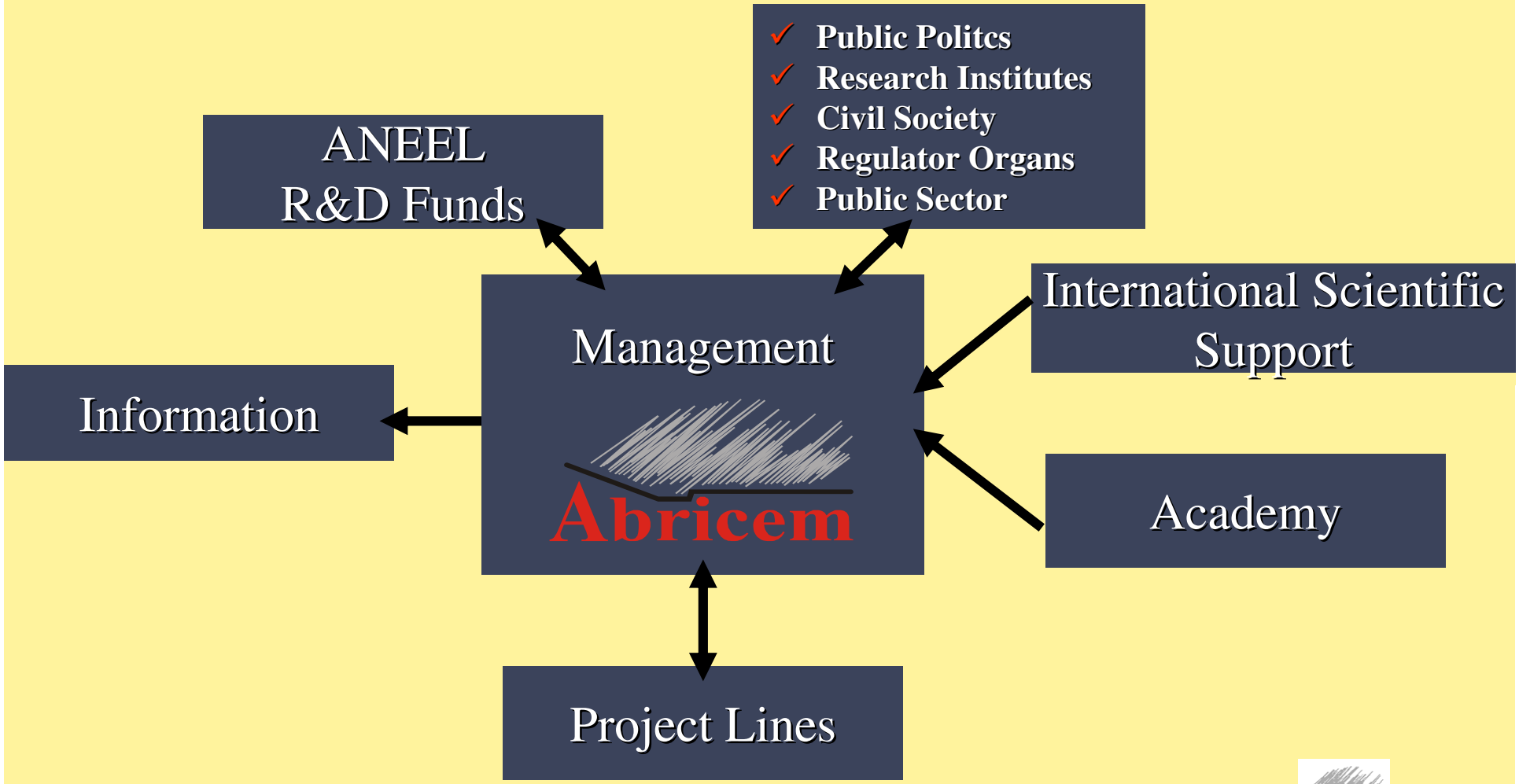
EMF-SP Project

Critical Scenary SP

Project Objectives

- Population and occupational epidemiologic studies on effects of 60 Hz exposure generated by electric power systems.
- Studies of risk perception
- Interpretation of the research results in the Brazilian context comparatively to the world context.

Project Model



Project Plan

EMF-SP PROJECT Project Lines LP	2005				2006				2007				2008				2009			
	1º	2º	3º	4º	1º	2º	3º	4º	1º	2º	3º	4º	1º	2º	3º	4º	1º	2º	3º	4º
LPA – Management																				
LPB – Scientific Assessment																				
LPC – Child Leukemia																				
LPD – Adult Cancer																				
LPE – Occupational Study																				
LPF – Risk Perception																				
LPG – Field Measurements																				
LPH – Urban Fields Profile																				
LP I - Documentation																				
LPJ – Project Diffusion																				
LPK – Knowledge transfer																				

Start-up Data Adquirement Analysis

Participation

- **WHO**
- **ICNIRP**
- **Ministério da Saúde**
- **Ministério de Minas e Energia**
- **ANEEL**
- **CREA-SP**
- **CEPEL**
- **Eletropaulo**
- **CPFL**
- **Bandeirante**
- **Elektro**
- **Furnas**
- **CTEEP**

LPC - Case Control Study of Childhood Leukemia and ELF

Research Group

- Leader : Victor Wünsch Filho
- Institution: FSPUSP - Depto Epidemiologia

Abricem

LPC - Objectives

- Evaluate the association between ELF exposure and childhood acute lymphoblastic leukemia (ALL) in the State of Sao Paulo.
- Compare 60 Hz magnetic fields exposure of cases (children with ALL) and controls (healthy children).
- Check the association between ELF and the incidence of ALL about :
  - children exposed to levels ≥0.3 μT .
  - distance to the high-voltage transmission lines.
- Study of ELF exposure prevalence in the State of Sao Paulo.

Method

- A population-based case-control study with children born since 2000 and ever lived in SP state
- Cases (children with ALL) from 8 hospitals in 4 cities in the state of Sao Paulo
- 4 matched controls selected per each ALL case
- Sample of 150 cases and 600 controls
- Cases and controls interviewed through a questionnaire
- 24 hours ELF measurements in the homes of cases and controls
- The distance from child house to TL is calculated by means of geo-processing
- The association between ELF and ALL evaluated using the conditional logistic regression models with control for potential confounding variables

Study progress

- Cases included in the system on line by hospitals that meet criteria of the study: 167
- Cases visited with magnetic field measurements : 104
- Controls visited with magnetic field measurements : 358

Preliminary outcomes

Prevalence by levels of exposure to magnetic fields

Magnetic fields (mG)	Included controls				Non Included controls	
	Int. measurement 24hs		Ext. measurement 3’		Ext. measurement 3’	
	n	%	n	%	n	%
< 1	251	70,1	200	56,0	635	50,2
1,00 – 1,99	71	19,8	86	24,1	303	24,0
2,00 – 2,99	17	4,8	24	6,7	122	9,6
≥3	19	5,3	47	13,2	205	16,2
TOTAL	358	100,0	357	100,0	1265	100,0

LPD - Ecological Study of Adult Diseases and ELF

Research Group

- Leader : Nelson Gouveia
- Institution: FMUSP - Depto de Medicina Preventiva

Abricem

LPD - Objectives

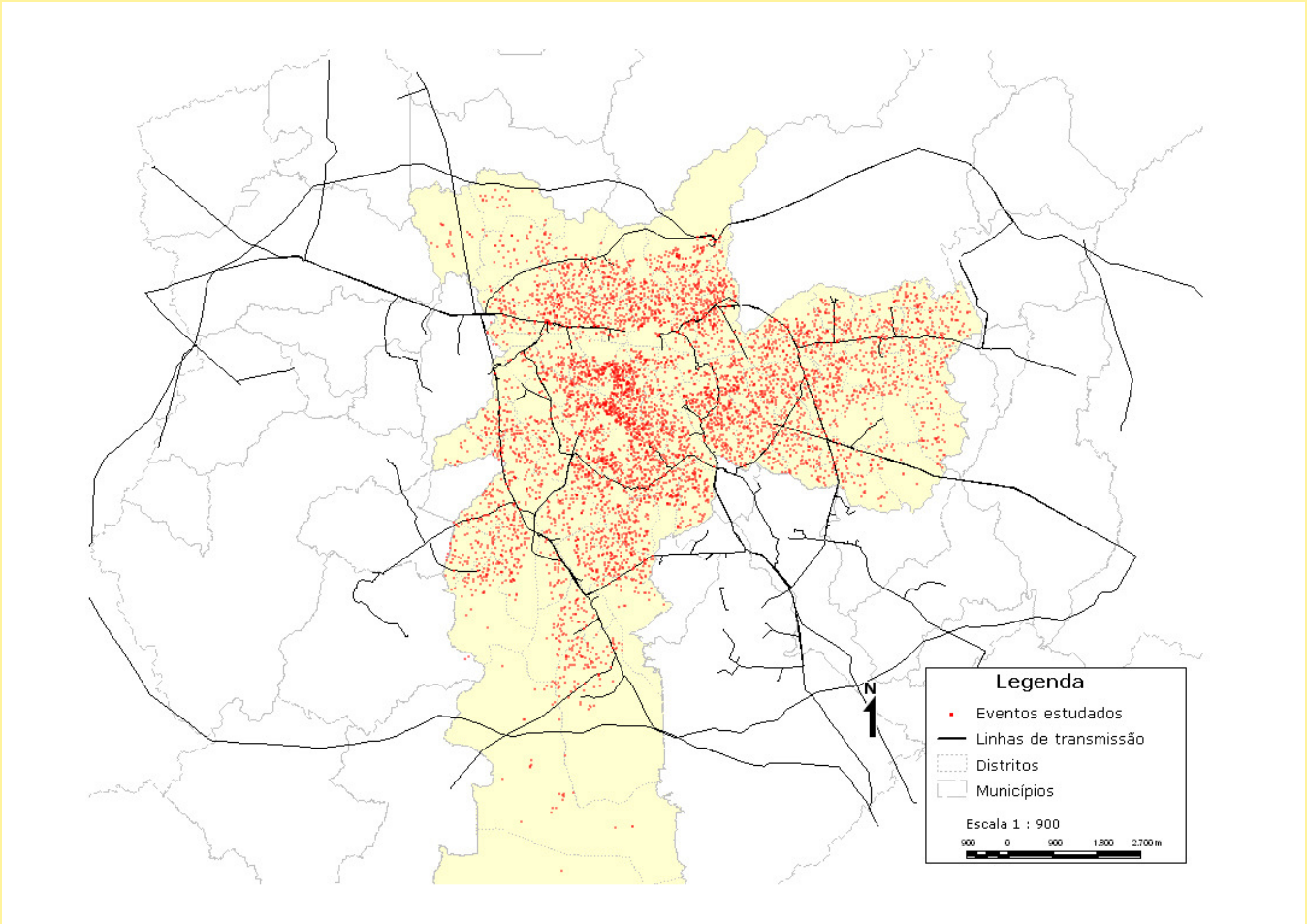
- Study to estimate the risk of death due to leukemia, cancers of the central nervous system and lateral amyotrophic sclerosis in adults living next to the transmission lines in São Paulo, Brazil.
- It will access socio-economic and demographic characteristics of the population living close the transmission lines and adjust for these factors in the analysis as needed.
- In collaboration with another LP it will also develop and use calculated fields and distances in the analysis.
- To evaluate the population prevalence of exposure to EMF (≥0.3 μT) from TL according to demographic and socio-economic characteristics.

METHODS

- Information on TL were provided by the local utilities and were geocoded in a Geographic Information System (GIS).
- Demographic and socioeconomic data were obtained from the 2000 census. This information was also included in the GIS.
- Based on the TL load a buffer zone was delimited considering an EMF up to 0.3 μT.
- Census blocks inside these buffer zones were considered exposed to EMF (prevalence of exposure)
- Cases and controls were deaths among people aged ≥ 40 years old between 2000 and 2005, drawn from the City Health Department Mortality Database.
- Cases included deaths due to leukemia, brain cancer and ALS. Controls included deaths due to all causes except those currently under suspicion of association with EMF
- Cases and controls were matched by gender, age group, and district of residence
- Cases and controls were geocoded by their addresses at the time of death, blindly for the case-control status
- Exposure was evaluated calculating fields considering the distance of the dwelling to the nearest TL
- Risk was estimated through conditional logistic regression.

Abricem

6500 cases-controls - GIS



Abricem

Preliminary outcomes

OR and 95% CI x distance to TL

Distance (meters)	Leukemia		Brain cancer		ALS	
	OR	IC 95%	*OR*	IC 95%	*OR*	IC 95%
≤ 50	1.57	0.93 - 2.69	0.62	0.34 - 1.1	0.33	0.02 - 2.63
> 50; ≤ 100	1.40	0.93 - 3.2	0.92	0.56 - 1.52	0.27	0.01 - 1.87
> 100; ≤ 200	1.27	0.86 - 1.88	1.16	0.77 - 1.63	1.56	0.57 - 4.64
> 200; ≤ 400	0.91	0.68 - 1.21	0.98	0.74 - 1.29	1.01	0.52 - 1.95
> 400 (reference)	1	-	1	-	1	-

Abricem

LPE - Occupational Study

Research Group

- Leader : Ricardo Cordeiro
- Institution: FCM/ Unicamp - Departamento de Medicina Preventiva Social

Abricem

LPE Focus Question

Is ELF exposure a aditional factor to work accidents risk?

LPE Oportunity

- Need to track exposure of workers to electromagnetic fields.
- High incidence of accidents at work in Brazil.
- Possibility that exposure to ELF decline the ability to perceive risk and this could increase the occurrence of work accidents.

LPE - Objectives

- To develop job-exposure matrix based on location, job task, and other parameters that may help to define jobs that are relatively homogeneous with regard to EMF exposure.
- This job exposure information is based on measurements, interviews and modeling.
- Questionnaire data to evaluate possible link between risk perception reduction and occurrence of work accidents.

Methods

- Construction, validation and implementation of a matrix of occupational exposure to assess occupational ELF.
- Prospective cohort study with 2500 workers to assess the ELF exposure, the risk perception within the environments of work and possible sources of stress arising out of the work.
- Instruments:
  - Questionnaire
  - Matrix of Occupational Exposure
  - Notification of Occupational Accidents

Matrix Validation

LPF – ELF Risk Perception

Research Group

- Leader : Marilda Lipp
- Institution: PUC Campinas - Faculdade de Psicologia

Abricem

LPF - Objectives

- Study of risk perception of population close to transmission lines , through interviews by trained personnel and conducted in random samples and focused groups.

Method

- **Participants**: Approximately 660 adults recruited from 11 communities of SP state pre-selected for the study.
- **Inclusion criteria**: live in the target areas, understand the questions, agree voluntarily to participate in the study and sign a informed consent form approved by the ethical committee.
- **Material**

  . A short questionnaire

  . The Inventory of Stress Symptoms ISSL

  . Informed consent form

Questions

1.The regulatory agencies do a very trustworthy job regulating risk exposure to electromagnetic fields so that people are very protected.

2. One has to worry all the time thinking about the risk to health posed by the electro magnetic fields.

3. Progress demands that transmission lines be placed everywhere and the benefits make it all worth the risk involved.

4. I think that we should stop completely placing transmission lines in our community because they can be dangerous to one's health

5. I do not trust that there is a good control of the risk of exposure to electromagnetic fields in my community.

6. I do not often even remember that there are transmission lines near by where I live.

7. In your opinion, what could be done about transmission lines and electric magnetic field exposure so that a person can feel comfortable with it?

Preliminary outcomes

Cluster 1:LESS RISK PERCEPTION:

Male, living in smaller towns, better educational level, no stress, greater trust in the government and in the controlling agencies, greater emotional comfort in regard to ELF.

- **Cluster 2: HIGHER RISK PERCEPTION:**

  Female, living in larger cities, less well educated, stressed, lower trust in the government and in the controlling agencies, less emotional comfort in regard to ELF.

Abricem

LPH – ELF Urban Fields

Research Group

- Leader : Mário Leite Pereira Filho

  José Roberto Cardoso

- Institutions :
  - IPT - LEO
  - Escola Politécnica da USP - Lmag

Abricem

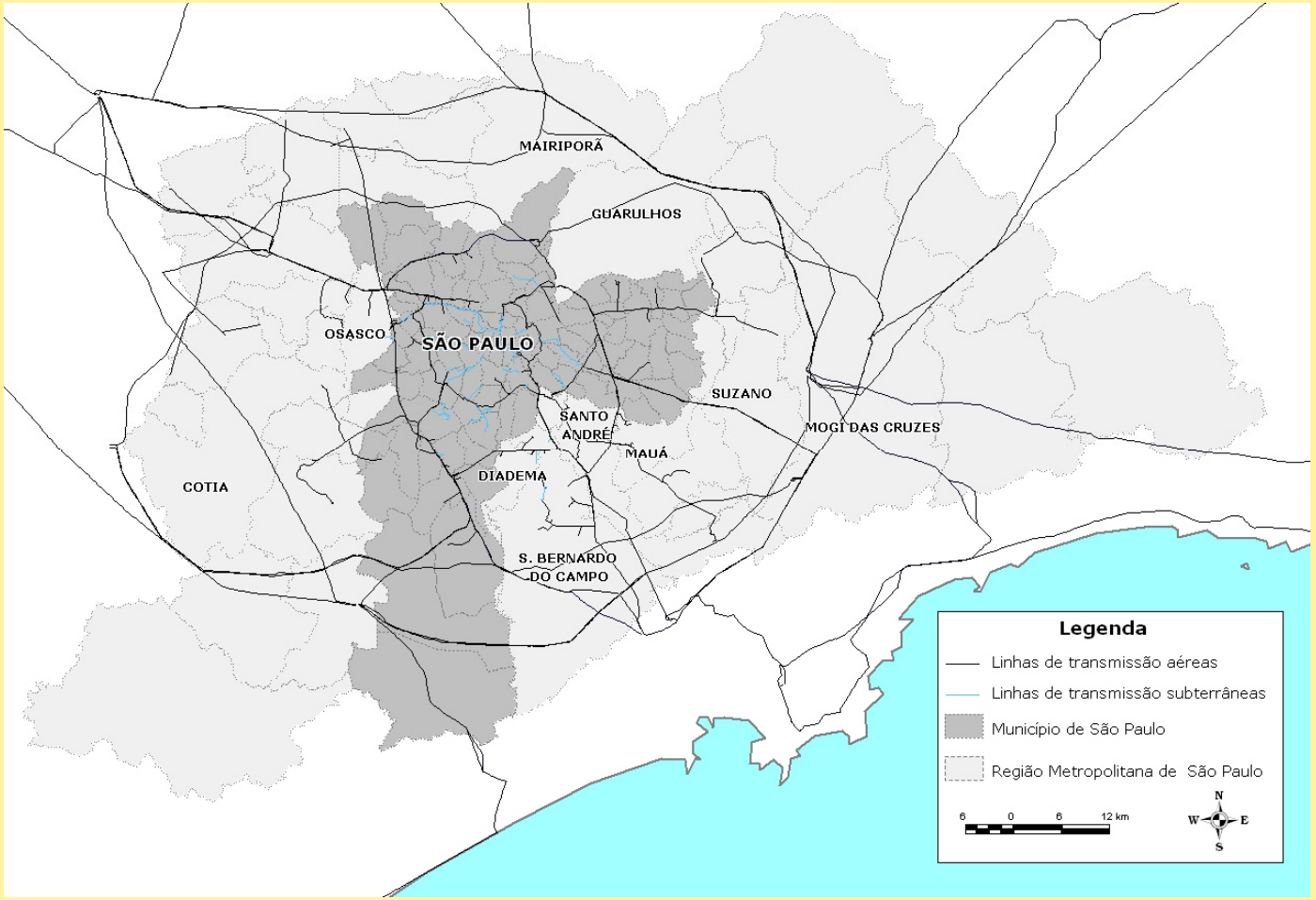
LPH - Objectives

- Provide information on calculated fields near power lines.
- Calculated fields validated by random measurements.
- Closely linked to other LP needs.

LPH Activities

- Assemble a GIS with high voltage transmission line (TL) data in São Paulo state.
- Build a model to calculate magnetic fields.
- Calculate corridors around TL with magnetic field ≥ 0.3 uT
- Calculate distance between cases-controls dwellings to nearest TL

TL Geoprocessed



Abricem

LPH Challenges

- Verify GIS data accuracy.
- Verify historical TL load data availability spanning several years.
- Estimate uncertainties from simplifying hypothesis, like uniform height x cable catenary, plain soil x topographic profiles.
- Estimate accuracy of geocoding: converting street address to geographical coordinates.

Project EMF-SP Benefits

- **Improve Brazilian specialists capability in epidemiologic researches.**
- **International recognition of the Brazilian epidemiologic research institutions.**
- **Skilling in ELF risk assessment and management.**
- **Contribute to laws and regulations discussions by providing relevant information .**
- **Facilitate the dialogue with the population involved for minimizing embargoes in power system expansions.**

Abricem

Final Remarks

- Quality in all project stages.
- Contributions to the scientific context.
- Subsidies to politics on ELF.
- Dialogue with legitimacy with Brazilian society.

Project Visibility

Thank You !

www.abricem.com.br