Which scope for gains?

Comparing the performance between Portuguese

Family Health Units vs. **Primary Health Care Centres**

organizational models through the use of discrete event

simulation models

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<u>Summary</u>

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2. Context and case study
3. Methodology and developed models
4. Data collection and validation
5. Results and tested scenario
6. Conclusions and future developments

Motivation

Development of tools that help decision making within the National Health Service (NHS)

Which potential gains arise from adopting a new organizational model in the Portuguese primary health care system?
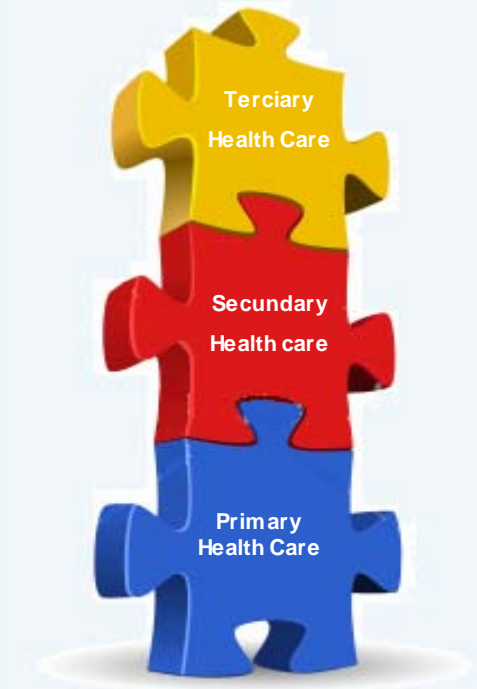
Context and case study

Portuguese NHS: "Hierarchical and ordered set of institutions and official health care provider services, functioning under the custody of the Minister of Health".

Responsabilities of the Portuguese NHS:

- **Equality** in access
- **Equity** in the allocation of resources and in use of services
- **Efficiency** in the management of the available resources
- **Costs** control

Portuguese NHS Levels:

- Primary Health Care
- Secundary Health Care
- Terciary Health Care

Terciary Health Care

Secundary Health care

Primary Health Care

Context and case study

Main problems identified within the Portuguese Primary Care System (2005):

- Crescent scarcity of general practitioners (GPs) and nurses
- High number of patients in primary health care centres without an allocated physician
- High number of waiting days for an appointment
- Excessive demand for hospital emergency consultations
- High and growing costs

**Inequitable
Inefficient
High cost**

Ongoing Primary Health Care Reforms

- Creation and launch of family health units (FHUs)

- Reconfiguration of primary health care centres throught their grouping into clusters (ACES)

Context and case study

Key objective of the study

Evaluating the **family health units' (FHUs)** organizational model, through the comparison of its performance with the **primary health care centres' (PHCCs)** organizational model.

Methodology and developed models

Available methods to reach the goal:
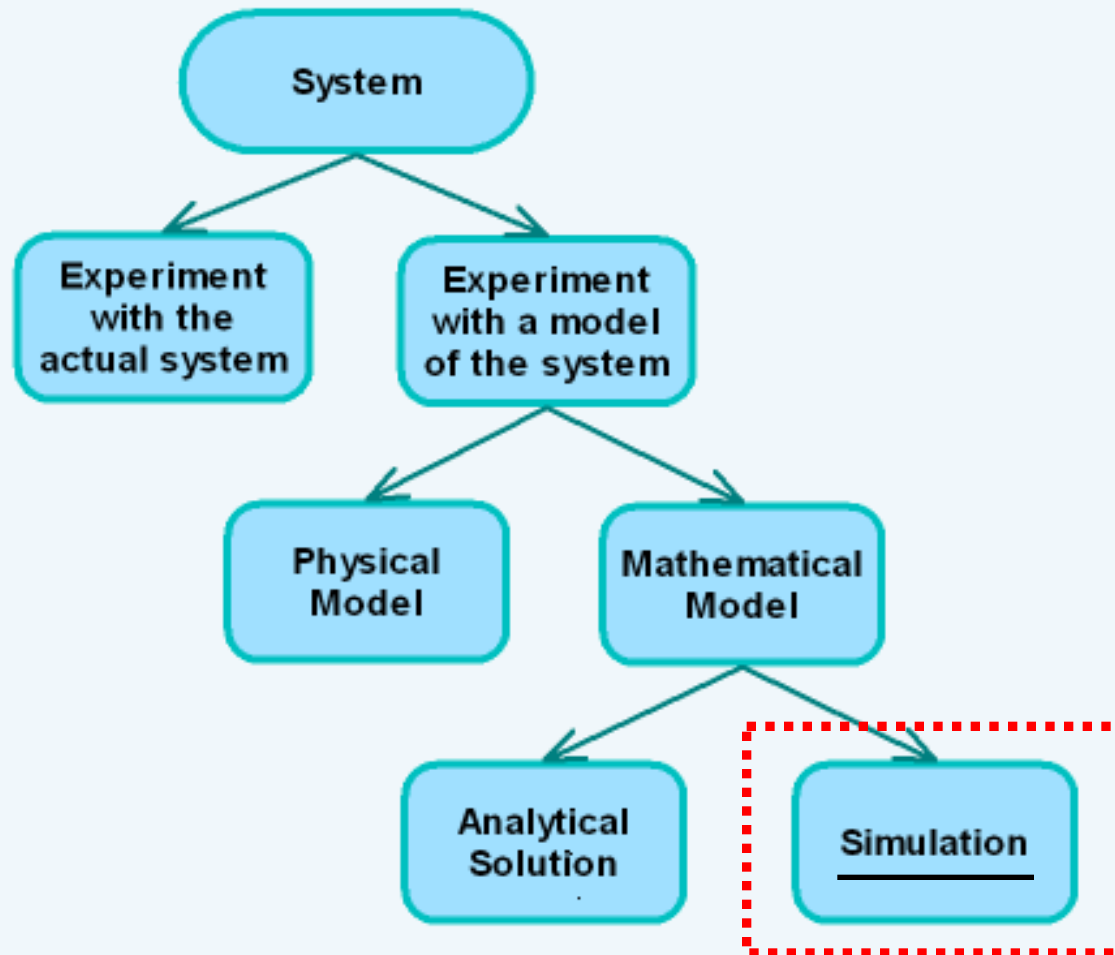
Methodology and developed models

Why Simulation?

▪ Health care units (eg. PHCCs and FHUs) evolve over time (eg. flux of patients, physicians and nurses) - **Dynamic**

▪ Elements like health care demand and appointment duration are not constant – **Stochastic**

▪ Activity based events within an health care unit occur in individual and isolated instants of time (eg. patient entering the health care unit, setting of an appointment, etc) - **Discrete**
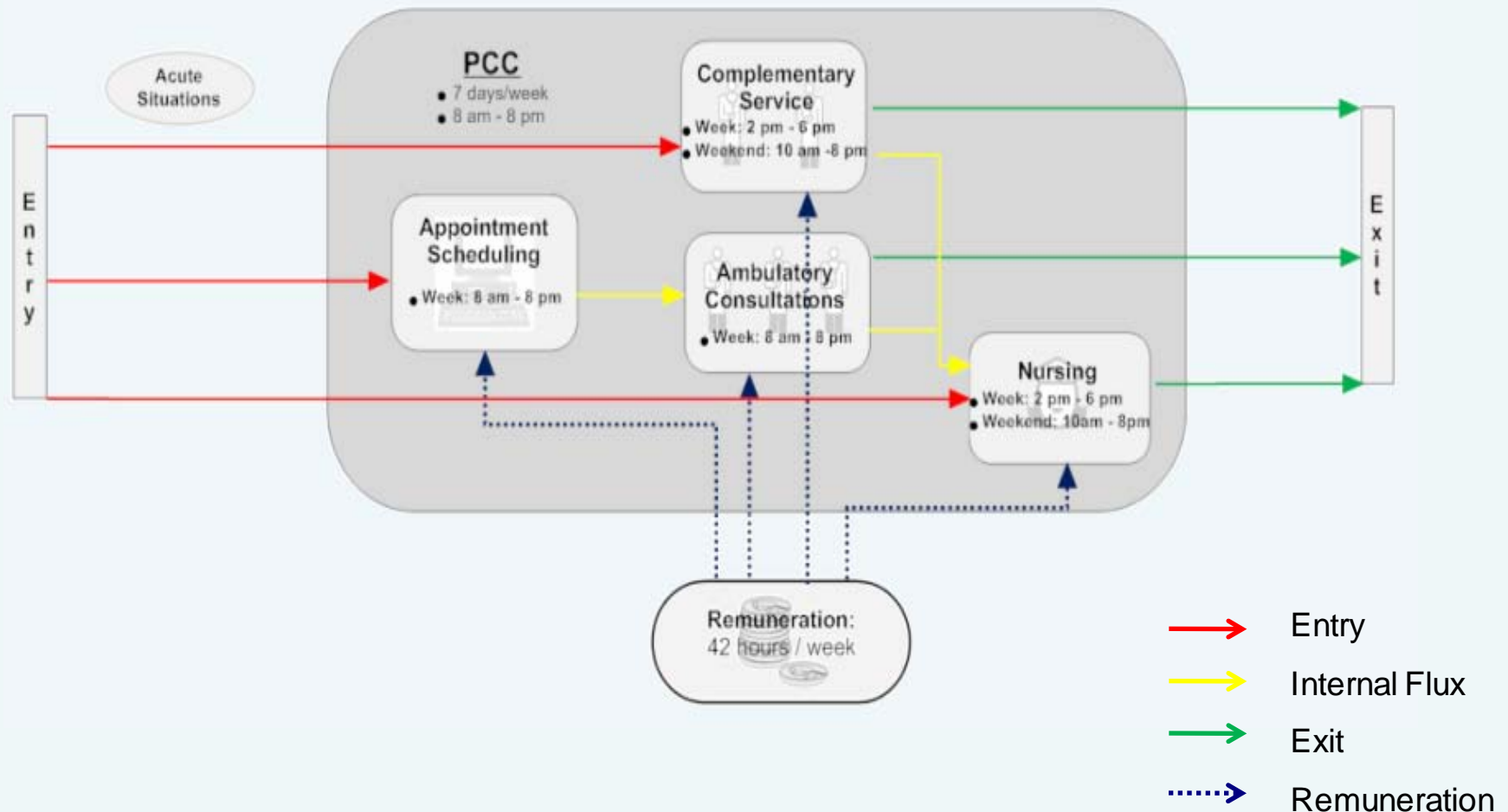
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Discrete Event Simulation Models (DES)

Note: No previous studies have used discrete event simulation models as a tool to compare the performance of alternative health care organizational models.
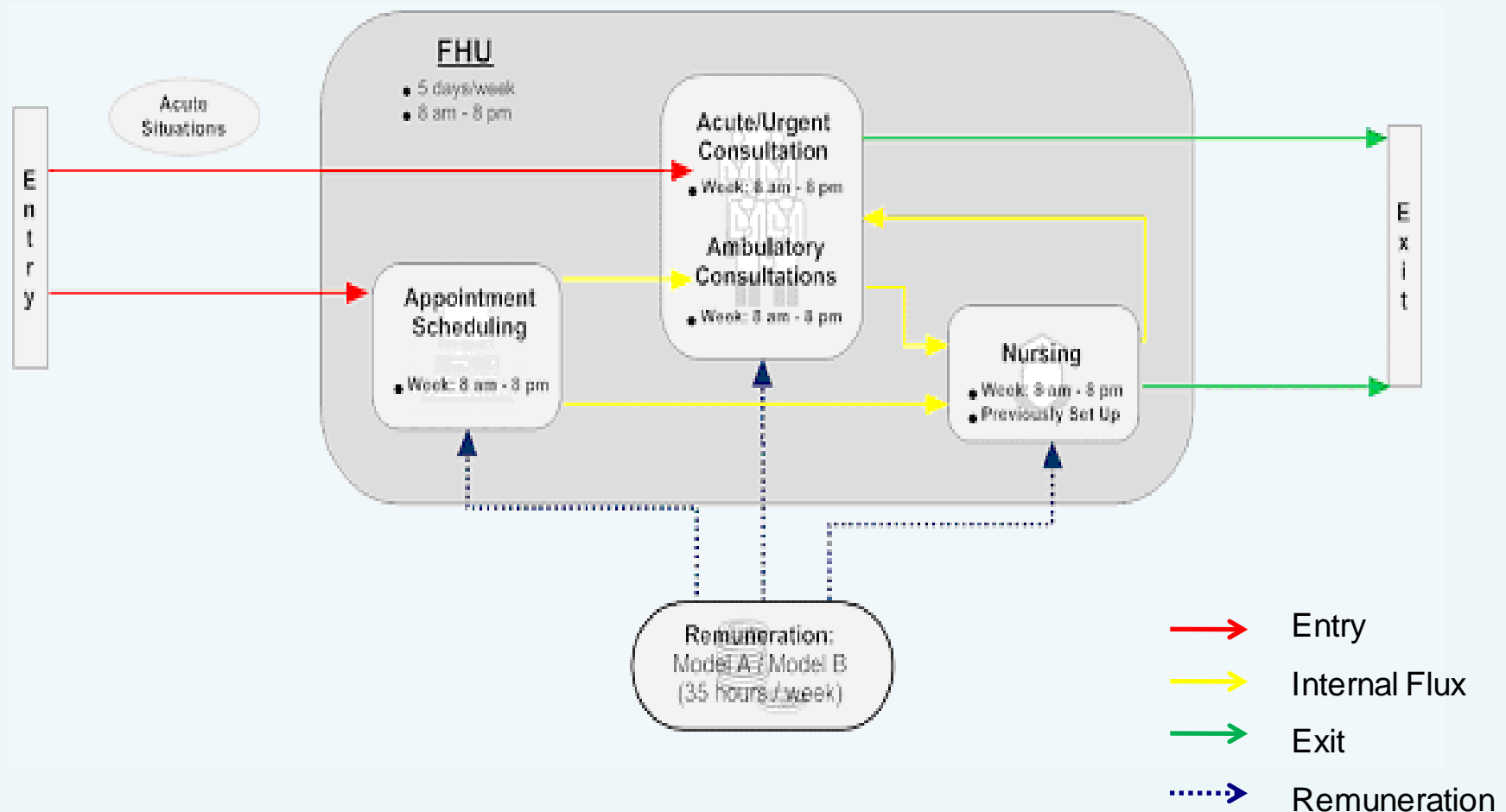
Methodology and developed models

Conceptual Model of a Primary Health Care Centre (PHCC):

Methodology and developed models

Conceptual Model of a Family Health Unit (FHU):

Methodology and developed models

Key organizational differences between PHCC's and FHU's:

|	PHCC	FHU
Timetable	**Working days (8AM – 8PM) Weekend (10AM – 8PM)**	**Working days (8AM – 8PM)**
Appointment Scheduling	**Ambulatory**	**Ambulatory and Nursing**
Ambulatory Consultations	**There are patients without a physician associated**	**All patients are associated with a physician**
Urgent / Emergency Consultations	**Specific timetable and physicians allocated**	**Patient is seen by its own physician within FHU's timetable**
Remuneration	**Usually to a 42 hours/week exclusive regime**	**35 hours/week in an exclusive regime plus: No incentives (Model A) With incentives (Model B)**

Methodology and developed models
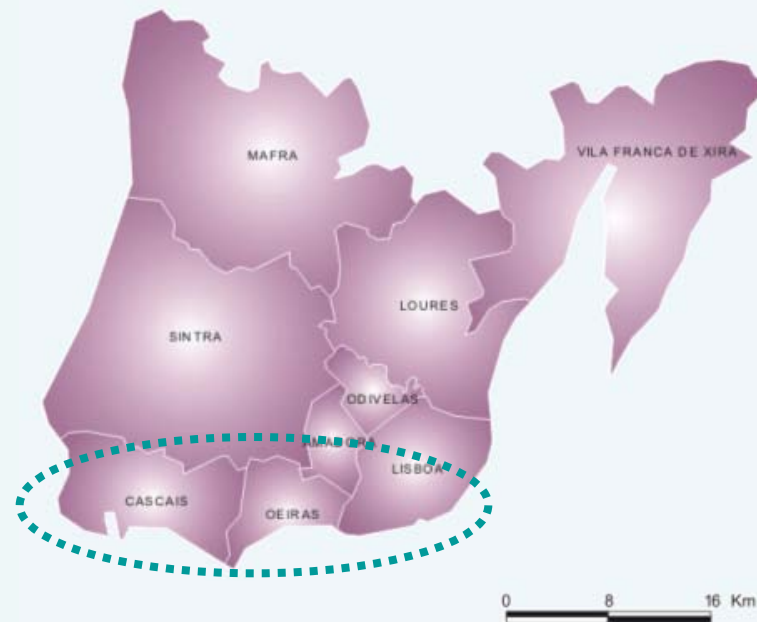
Studied Area:

- Simulation model applied to 12 PHCCs and 7 FHUs

- Units operating within the *Lisboa, Oeiras* and *Cascais* municipalities

Methodology and developed models

Studied Area:

Region	Population 2001	Population 2007	Variation (%)	Ageing Index
Greater Lisbon	1 947 261	2.025.628	4,02	109,9
Lisboa	564 657	499.700	-11,50	177
Benfica	41 368	-	-	-
Carnide	18 989	-	-	-
São Domingos de Benfica	33 678	-	-	-
Oeiras	162 128	171.472	5,76	113,8
Barcarena	11 847	-	-	-
Carnaxide	21 354	-	-	-
Oeiras e São Julião da Barra	34 851	-	-	-
Paço de Arcos	23 496	-	-	-
Algés	19 542	-	-	-
Cruz Quebrada-Dafundo	6 591	-	-	-
Linda-a-Velha	21 952	-	-	-
Cascais	170 683	186.947	9,53	99,2
Alcabideche	31 801	-	-	-
Cascais	33 255	-	-	-
Estoril	23 769	-	-	-
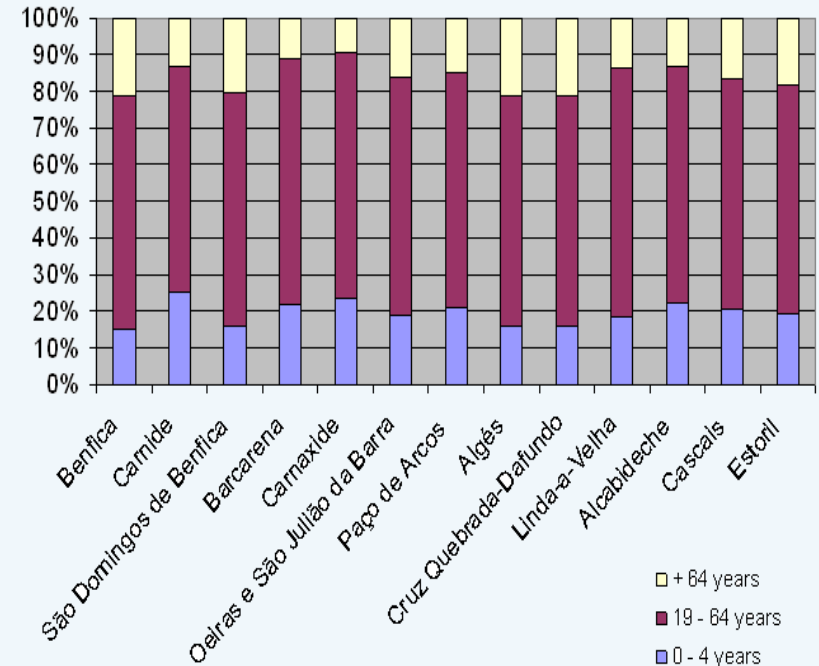
Source - Instituto Nacional de Estatística

- Growing population in *Oeiras* and *Cascais*, and decreasing population in *Lisboa*

- Younger population in *Oeiras* and *Cascais*

Methodology and developed models
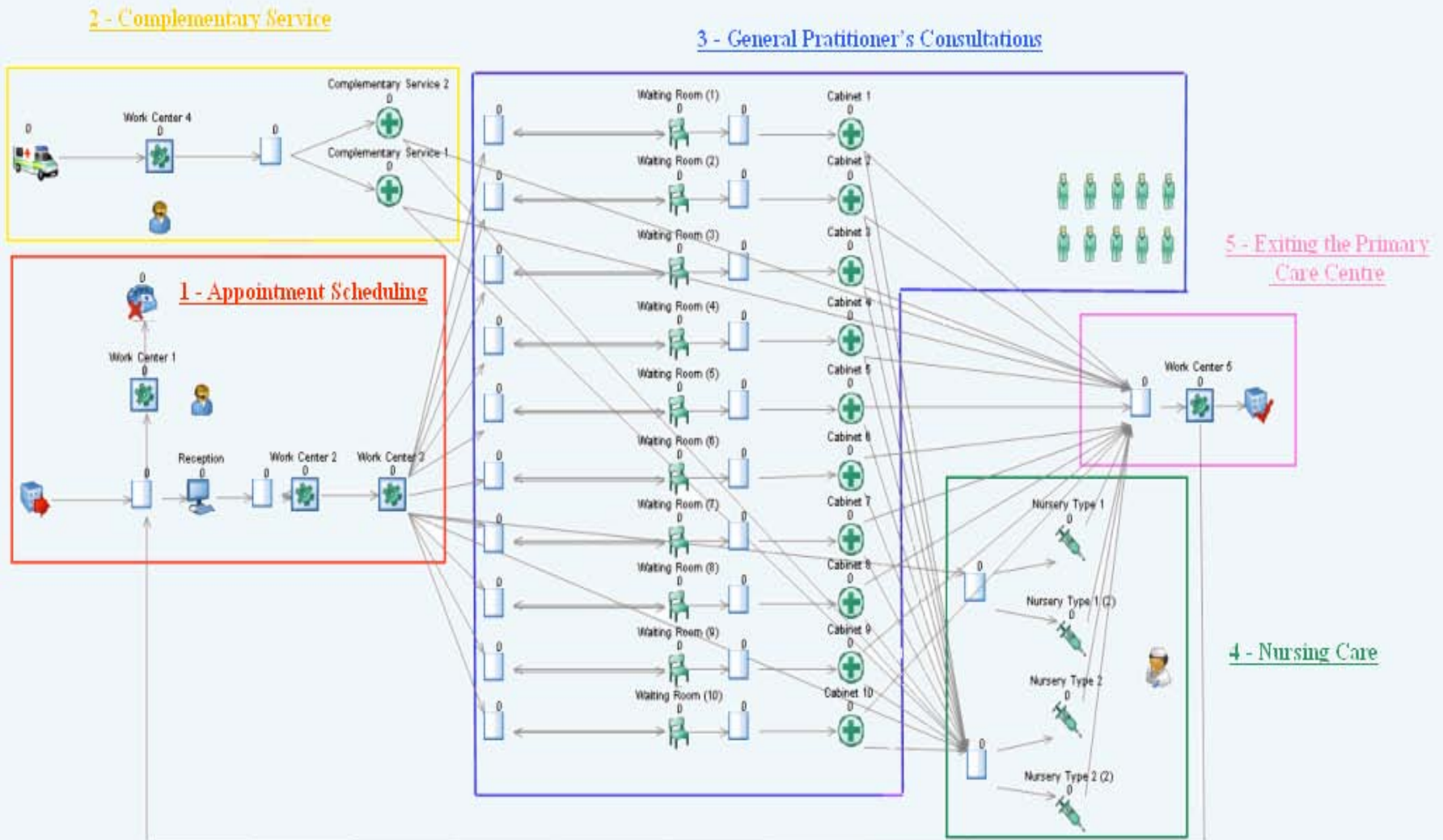
Computational Implementation:

- *Simul8* (software for discrete event simulations – DES)

- Object based simulation. Interactions between objects established through routines programmed in Visual Logic language

|	
🔴	***Work Items*** – correspond to the central objects in the model (Eg. patients)
	Work Entry Point – place through which Work Items enter the model (Eg. patients entering the primary health care unit)
	Storage Bins – place where Work Items wait until resources are available (Eg. patients in the waiting room of a primary health care unit)
	Work Centers – place where a certain task is performed within a certain amount of time and requiring specific resources (Eg. Physicians' cabinets or a nursing room)
	Resources – items required by Work Centers in order to perform a certain task (Eg. physicians, nurses, managers)
	Work Exit Point – place where Work Items exit the model (Eg. Patients exiting a primary health care unit)

Methodology and developed models

Computational Implementation of a Primary Health Care Centre (PHCC):

Eg. PHCC Benfica

Computational Implementation of a Family Health Unit (FHU):

Eg. FHU RM
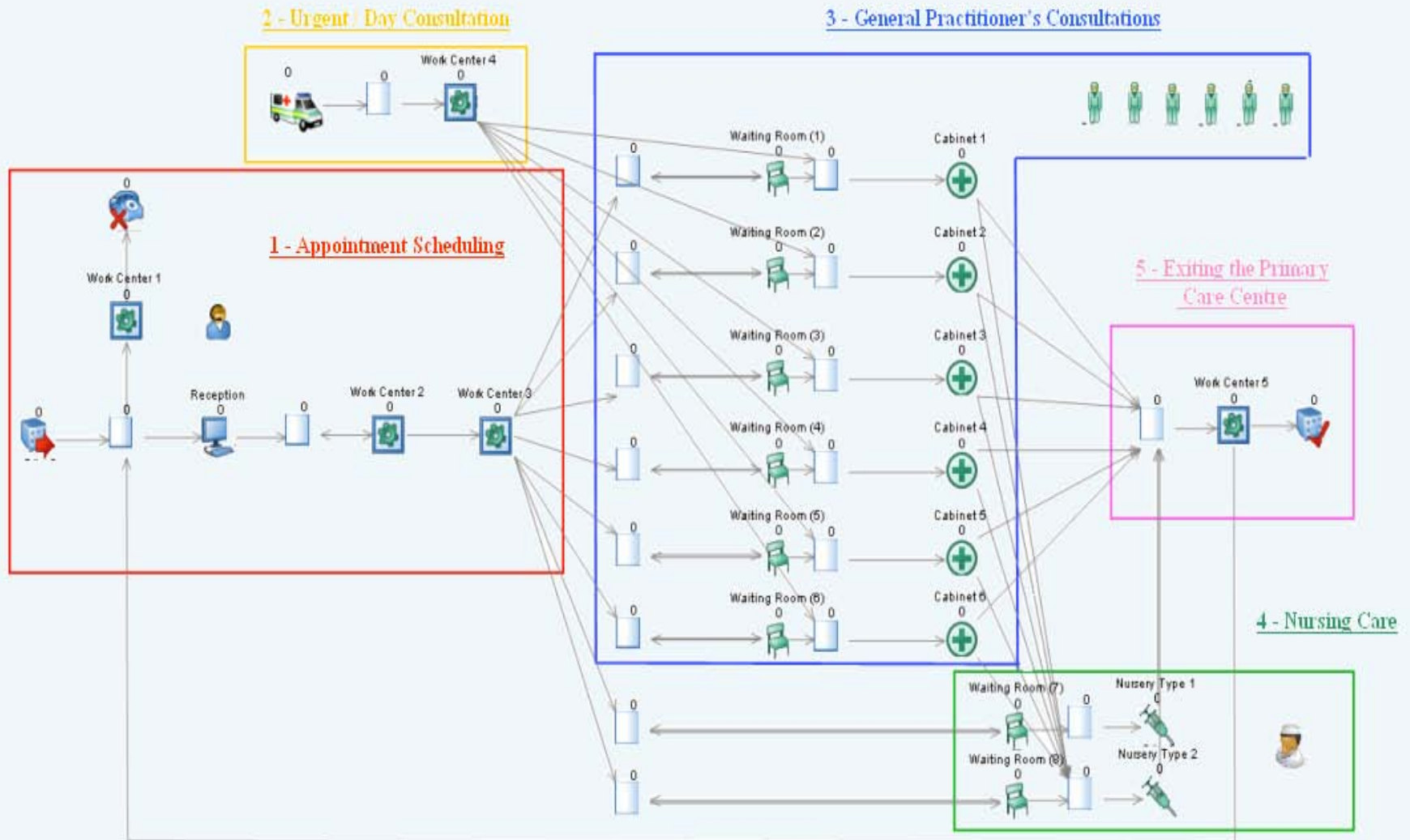
Data collection and validation

| Multiple Data Sources |
|---|
| ▪ ARSLVT |
| ▪ Missão para os Cuidados de Saúde Primários |
| ▪ Agência de Contratualização de Lisboa e Vale do Tejo |
| ▪ ACSS |
| ▪ DGS |
| ▪ Action plans and activity reports from several PHCCs and FHUs |

- Future development of the models in use will require a higher amount and more precise data

- The reliability of the obtained results and tested scenarios depends on the maintenance of the behaviour of the units used as a source of data.

Data collection and validation

Validation

▪ Each model was played under a trial with 5 runs.

▪ Each of these runs consisted on a 50 weeks period (approximately 1 working year), with a previous warm-up period of 52 weeks (1 complete year)

▪ Validation through _black-box_ strategy – comparison of the data returned by the models with the real data (2007).
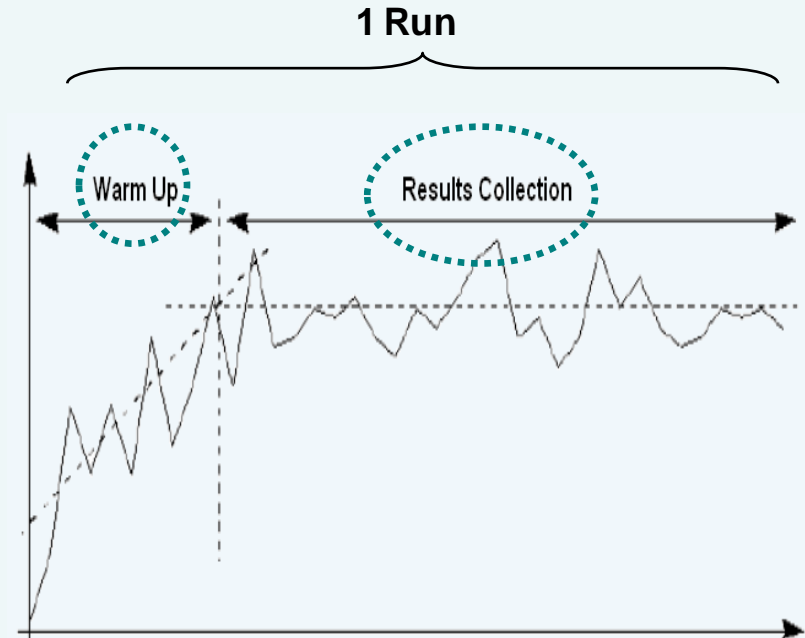
Conclusion: The real data of production (eg. number of ambulatory appointments, number of acute/urgent appointments, etc) was within the 95% confidence intervals returned by the simulation models
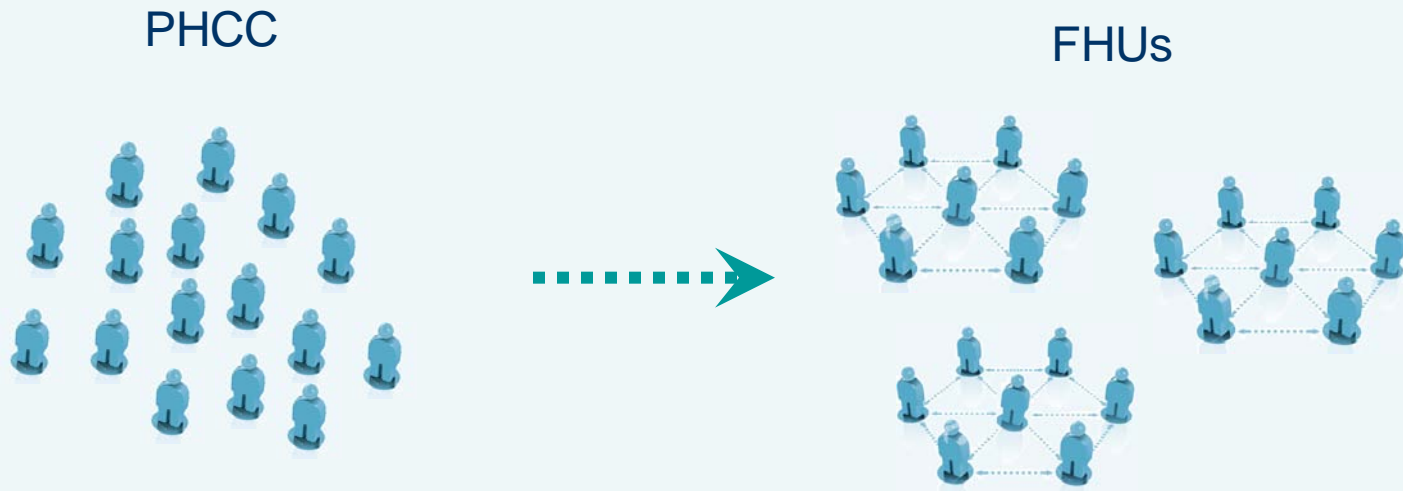
Results and tested scenario

Simulated results for the year 2007:

	PHCCs	FHUs	Difference
Average number of days required to set an ambulatory consultation	30 days	14 days	- 53,3%
Average time spent in the waiting room waiting for an ambulatory consultation	55 minutes	32 minutes	- 41,8%
Average time spent in the waiting room waiting for an acute/emergency consultation	12 minutes	13 minutes	+ 5,5 %
Average time spent in the waiting room waiting for an nursing consultation	4 minutes	3 minutes	- 25,1%

Tested Scenario:

Conversion of all studied PHCCs into FHUs

PHCC → FHUs

Results and tested scenario

Tested Scenario:

	Before Conversion (PHCC)	After Conversion (FHU)	Variation
Acessibility			
Average number of days required to set an ambulatory consultation	24 days	17 days	- 41,2%
Efficiency			
Average time spent in the waiting room waiting for an ambulatory consultation	50 minutes	38 minutes	- 31,7%
Average time spent in the waiting room waiting for an acute/emergency consultation	12 minutes	13 minutes	+ 5,5%
Average time spent in the waiting room waiting for an nursing consultation	4 minutes	3 minutes	- 25,1%

Results and tested scenario

Tested Scenario:

	Before Conversion (PHCC)	After Conversion (FHU)	Variation
Productivity			
Average number of ambulatory consultations per physician	4379	4796	+ 8,7%
Average number of nursing consultations per nurse	2443	2814	+ 13,2%
Average number of urgent/acute consultations per physician	722	709	- 1,8%

Results and tested scenario

Tested Scenario:

	Before Conversion (PHCC)	After Conversion (FHU)	Variation
Costs			
Average costs with personnel per primary health care unit	731.383 €	869.394 €	+ 15,9%
Average costs with drugs, diagnosis tests and other treatments per primary health care unit	2.128.928 €	1.784.532 €	- 19,3%
Average total costs per primary health care unit	2.860.311 €	2.653.926 €	- 7,8%

Note: Due to data's lack of quality, the values presented here represent an overall estimation of the scenario

Conclusions and future developments

- FHUs allow for improvement in the processes of scheduling appointments, delivering physician's and nurses' consultations, as well as in cost savings.

- These gains seem to be stronger for the conversion larger PHCCs into FHUs.

Main Conclusion

The ongoing Portuguese primary health care reform of implementing FHUs seems to lead to visible improvements on the **accessibility, efficiency, quality** and **cost savings** within this sector.

Conclusions and future developments

Future Developments
▪ New scenario testing
▪ Extension of the proposed models to the rest of the country
▪ Inclusion of more services and enrichment of the models
▪ Estimating costs with more reliable data
▪ Need for a higher amount of data and closer collaboration with policy makers.