

F.J. Somolinos-Simón<sup>1</sup>, G. García-Sáez<sup>1,2</sup>, J. Tapia-Galisteo<sup>1,2</sup>, M.E. Hernando<sup>1,2</sup>

<sup>1</sup>Center for Biomedical Technology, ETSI de Telecomunicación, Universidad Politécnica de Madrid, Madrid, Spain

<sup>2</sup>CIBER-BBN: Networking Research Centre for Bioengineering, Biomaterials and Nanomedicine, Madrid, Spain

## Introduction

**Type 1 Diabetes (T1D)** and its complications are a major cause of **morbidity** and **mortality** in the world.

**Patients** with T1D require the **administration of insulin** to maintain **glycemic control**.

Currently, two **modes of subcutaneous insulin delivery** have gained wider acceptance:

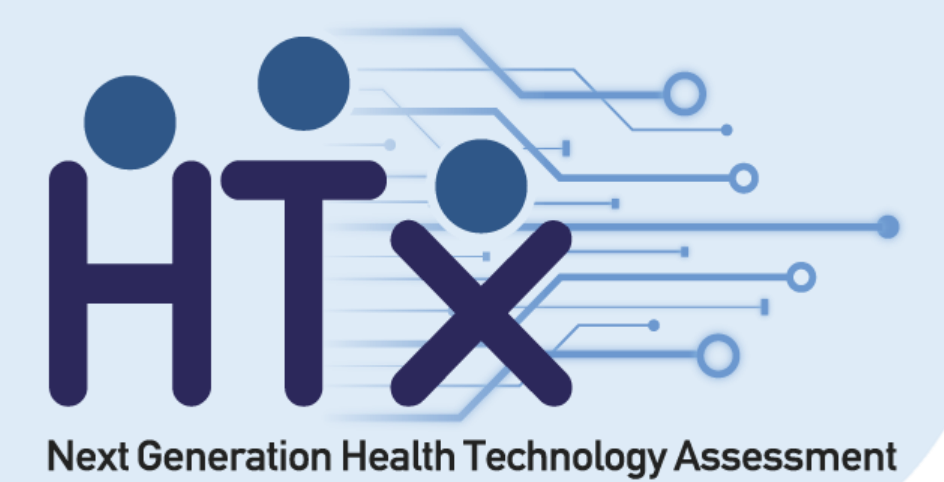
- Multiple daily injections (MDI).**
- Continuous subcutaneous insulin infusion (CSII).**

Randomized controlled trials (RCT) have shown that, when compared with MDI, **CSII** was associated with a slightly **lower glycated hemoglobin (HbA1c)** level.

## Aims

The **case study on diabetes** of the **H2020 HTx project** ([htx-h2020.eu](http://htx-h2020.eu)) aims to link **evidence from RCTs to Real World Data** and **estimate the impact of health technology** on specific subgroups of patients, as a first step to **build prediction models** to personalize treatment strategies. This work aims:

- 1** To **assess** if patients with T1D can be stratified in **subgroups** according to different determinants.
- 2** To **analyze** if subgroups are associated to **treatment strategies**.



## Methods

**1** Use of a longitudinal, prospective **data repository** with T1D patients from **83 clinics in the United States** (T1D Exchange).

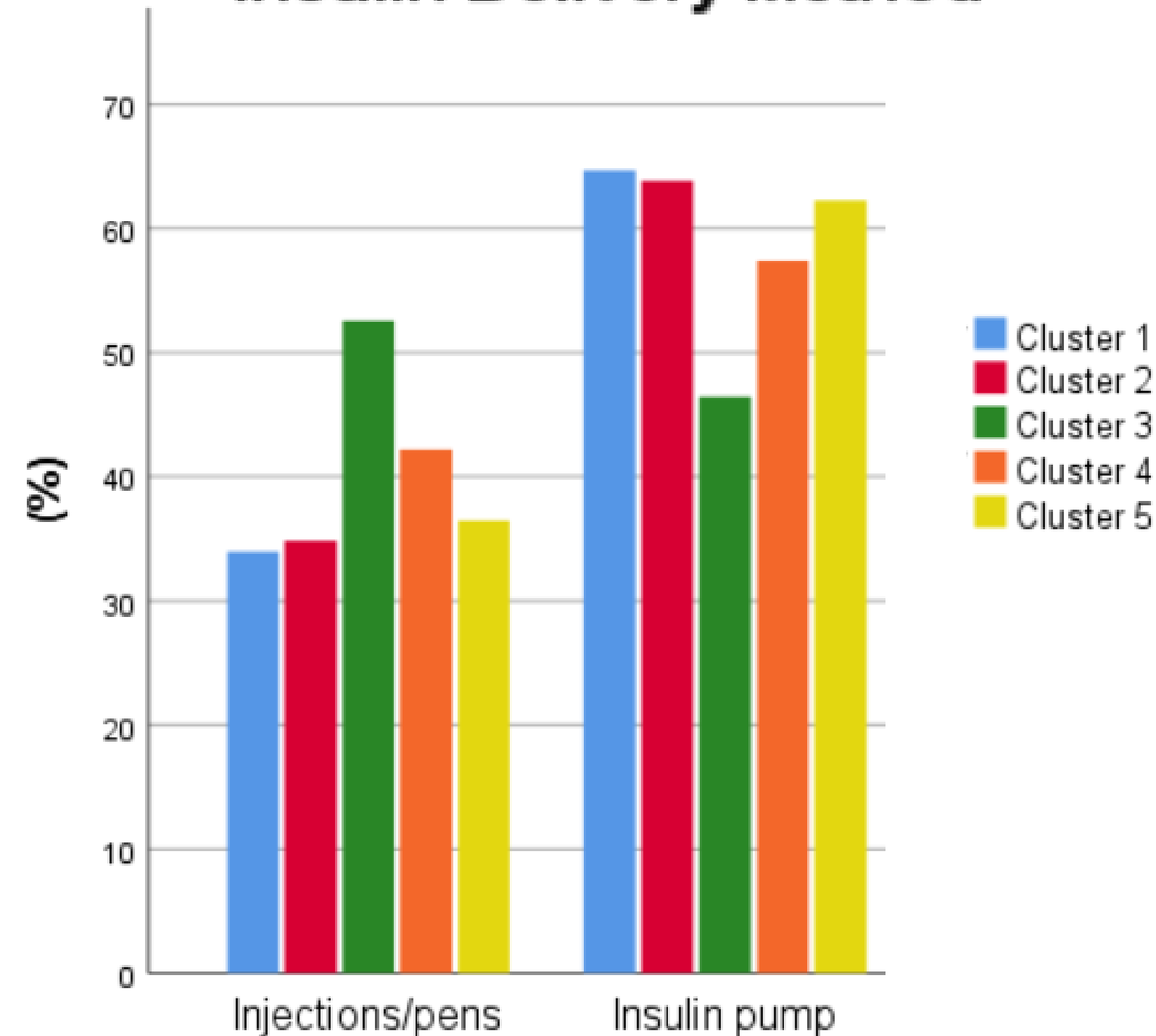
**2** **Preprocessing and filtering** of data in order to obtain **adult individuals with more than five years of disease duration** from **initial enrollment** (n = 8 034).

**3** A data-driven **TwoStep clustering analysis** based on **age at diagnosis, diabetes duration, body mass index (bmi) or HbA1c**.

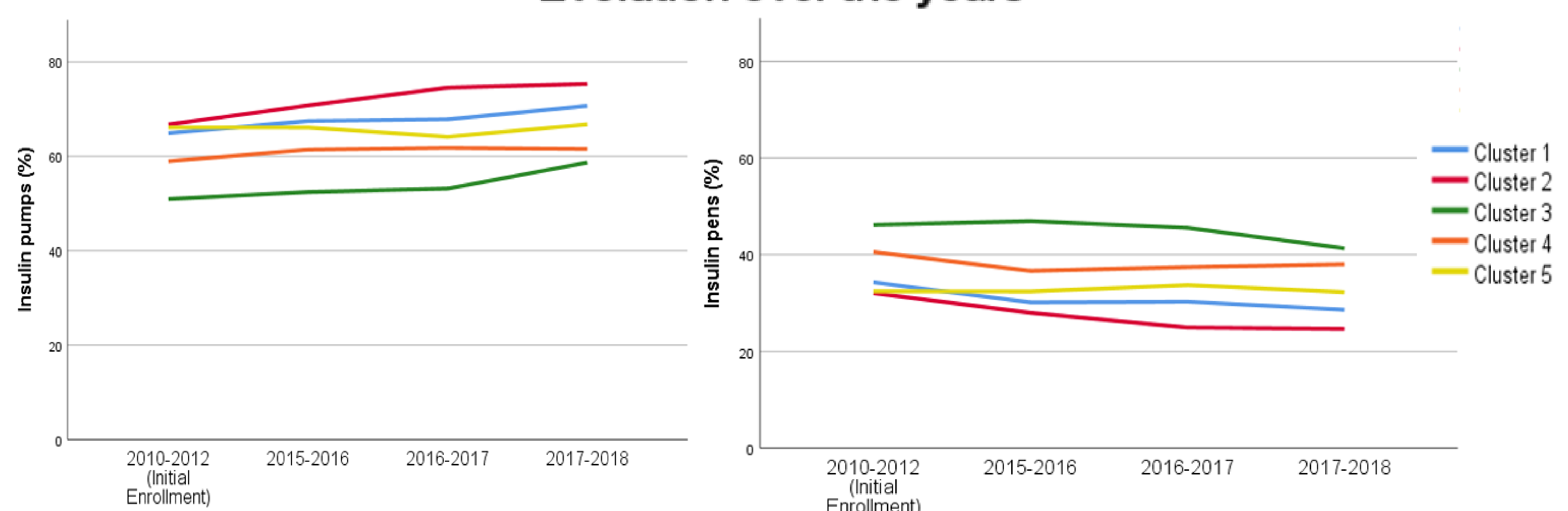
**4** The **optimal number of clusters (five)** was estimated on the basis of **silhouette width**.

## Results

Insulin Delivery Method



Evolution over the years



CLUSTER	AGE AT DIAGNOSIS (YEARS)		DIABETES DURATION (YEARS)		HBA1C (%)		BMI (KG/M <sup>2</sup> )	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	14.69	8.22	<b>38.90</b>	7.32	7.34	0.95	26.17	3.49
2	14.58	9.19	<b>21.85</b>	10.01	7.94	1.02	<b>34.36</b>	3.14
3	9.26	5.18	13.54	5.85	<b>10.12</b>	1.08	25.07	3.72
4	34.68	8.77	16.32	7.03	7.62	1.13	26.24	3.65
5	9.72	4.84	15.01	6.12	7.39	0.77	24.62	2.69

\*SD: standard deviation

## Conclusions

This preliminary work shows that **T1D patients can be stratified in subgroups**.

**Future research** includes study of **complications and drugs** associated to different clusters and additional **data sources** and creation a **powerful tool** to account for **treatment effectiveness** in patients subgroups.