**CVMMyM2**

**Título: An early alarm based on the insulin resistance curve for the diagnosis of diabetes in Mexico**.

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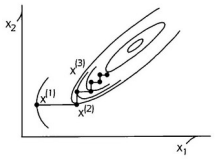
**Abstract**.

In this talk, we will describe the preliminary methodology developed within the project "Methodologies for early detection of insulin resistance". The methodology is primarily based on Transform Band Depth (STtD) variables. Type 2 diabetes is one of the most frequent chronic degenerative diseases and one of the main causes of mortality and morbidity in contemporary society. It is well known that a timely diagnosis of insulin resistance, followed by lifestyle changes, can prevent the development of diabetes. Hence, the great social importance of designing a costeffective, dynamic, non-invasive, and accessible model for the early detection of glucosa metabolism alterations. One of the most widely used indicators to determine insulin resistance is the so-called HOMA (Homeostatic model assessment). However, this has several limitations and a lack of standardization among different patient populations, and it doesn't properly exist for Mexican populations.

The proposed methodology contemplates two main scopes: 1) the definition of a new indicator of insulin resistance based on functional data analysis; 2) the construction of quantile regression models capable of associating covariates of interest with the proposed indicator.

With respect to the first objective, the indicator functional HOMA (fHOMA) is introduced to determine insulin resistance levels starting from the relationship between insulin and glucose curves. This new methodology employs tools within multivariate functional data analysis, as we have observations from the bivariate functional process $(g(t), \eta(t))$, $t \in (0, 120)$, where g, $\eta$ are glucose and insulin curves, respectively.



The advantages of this new indicator are:
• It employs nonparametric tools that contemplate the functional nature of g, and η curves;
• It standardizes ranges associated with insulin resistance levels.

On the other hand, nonlinear quantile regression models are constructed for the variable fHOMA with respect to covariates of interest. It is important to mention that the data we have are research data since obtaining the insulin curve involves a costly and highly invasive study for the patient, so the insulin curve is not available in common medical practice. That is why the main advantage of these models is to be able to predict the behavior of a variable that is latent in practice.
The complementary advantages of the proposed models are:

• Captures nonlinear dependence structures;
• Do not present restrictions on the dimension of the covariate vector;
• The predictions of the models are probability intervals for the variable fHOMA;
• The model estimates probabilities of belonging to the insulin resistance levels defined by fHOMA.
• It generates a natural way to measure the stages of insulin resistance so that preventive or control clinical procedures can be generated.