

# Real change or natural fluctuation?

Citation for published version (APA):

Hilderink, J. M. (2021). *Real change or natural fluctuation? Linking laboratory results to clinical practice*. [Doctoral Thesis, Maastricht University]. Maastricht University. <https://doi.org/10.26481/dis.20210330jh>

## Document status and date:

Published: 01/01/2021

## DOI:

[10.26481/dis.20210330jh](https://doi.org/10.26481/dis.20210330jh)

## Document Version:

Publisher's PDF, also known as Version of record

## Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

## General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

[www.umlib.nl/taverne-license](http://www.umlib.nl/taverne-license)

## Take down policy

If you believe that this document breaches copyright please contact us at:

[repository@maastrichtuniversity.nl](mailto:repository@maastrichtuniversity.nl)

providing details and we will investigate your claim.

## Impact paragraph

In this last chapter the valorization of this thesis will be further explored. Valorization is the social utilization of scientific knowledge. It is about the why behind the research and is intended to make knowledge usable other than for scientific purposes only.

The valorization of this thesis consists of two parts. The first part of the valorization in this thesis is the development of the medical smartphone app *Labtracker*. The development of the smartphone app *Labtracker* boosts the valorization of the results of this thesis. This app helps its users to compare two laboratory results with each other in a fact based and scientifically sound manner, and facilitates the assessment of whether the change between these two results is a clinically relevant change or not. Specifically, *Labtracker* calculates the probability that an increase or decrease over time in a specific blood parameter is real, given the time between measurements. It reduces the need for physicians to rely on their clinical experience and intuition when they have to interpret whether a change between serial laboratory measurements is a “real” change or a natural fluctuation.

Another important part of the valorization of this thesis is the enrichment of the database on within-subject biological variation along two dimensions. First, researching additional/new parameters has increased the breadth of the database; second, the depth of the database has been increased for specific parameters, by looking at the difference between healthy and chronically ill individuals, and by looking at the difference in biological variation within a day.

Both the development of the app and the enrichment of the biological variation database can have an impact on three important themes: health care, education, and prevention.

### **Healthcare**

By using *Labtracker* based calculations to distinguish between a real change and a natural fluctuation, concerning a change between serial laboratory measurements, a physician can make a more scientifically based choice in the field of laboratory diagnosis and with this, he can make better decisions.

Besides, healthcare may improve by avoiding unnecessary treatments and/ or diagnostics when using *Labtracker*, such as prescribing a cholesterol inhibitor in a person with a cholesterol increase (that may be due to biological fluctuation instead of a real cholesterol increase).

Concerning the enrichment of the biological variation database, healthcare may improve by facilitating physicians with an extensive dataset of biological variation of laboratory parameters, with which they can easily detect a 'real change' in laboratory parameters that may be clinically relevant.

Possibly, in the future, the way of measuring laboratory parameters will change. Techniques such as body sensors or infrared methods are rapidly developing. When this data generation will be expanded, the biological variation database will be essential to deal with all these laboratory data.

### **Prevention**

Through the broadening of the biological variation database and the development of *Labtracker*, physicians can make a better estimate of the variability of laboratory measurements over time and hereby, they can better predict and possibly prevent the development of a disease. With this, the results of this thesis open doors to ways of preventive healthcare. Also patient can use the app *Labtracker* for themselves, to monitor their laboratory values and compare them with each other. By detecting an abnormality in an early stage, prevention and early-stage treatments will become more important. And eventually, this may lead to less expensive treatments, and even more important, a more value based healthcare for the patient.

### **Education**

Young or inexperienced doctors are quickly brought to a higher level of interpreting laboratory diagnostics and developing a clinical 'sense' or intuition whether a change between serial laboratory measurements is a real change.

This speeds up the growth and development of physicians. By using *Labtracker* (inexperienced) clinicians become more aware of the variation within laboratory results. This may lead to less incorrect interpretations of a change in serial laboratory results and to a decreasing amount of unnecessary treatments.

For example, this thesis shows the variability of hemoglobin during the day. By having knowledge about the biological variation of such a parameter or using *Labtracker* (in which this knowledge is incorporated), physicians can determine more easily whether or not it is necessary to give an iron supplement or a blood transfusion. The app *Labtracker* can serve as an educational tool to verify the clinical intuition and it can serve as a reference to check the (diurnal) biological variation of the parameter.