

Improving quality of child consultations in Burkina Faso using ML: Detecting and addressing Health Workers' diagnostic mistakes

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AMLD 2020



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**CLOUDERA
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Terre des hommes
Helping children worldwide.

leDA: Integrated e-Diagnosis Approach



ASSESS AND CLASSIFY THE SICK CHILD AGED 2 MONTHS UP TO 5 YEARS



ASSESS

ASK THE MOTHER WHAT THE CHILD'S PROBLEMS ARE

- Determine whether this is an initial or follow-up visit for this problem.
 - if follow-up visit, use the follow-up instructions on *TREAT THE CHILD* chart
 - if initial visit, assess the child as follows:

CHECK FOR GENERAL DANGER SIGNS

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| ASK: | LOOK: |
| <ul style="list-style-type: none"> • Is the child able to drink or breastfeed? • Does the child vomit everything? • Has the child had convulsions? | <ul style="list-style-type: none"> • See if the child is lethargic or unconscious. • Is the child convulsing now? |

CLASSIFY

IDENTIFY TREATMENT

USE ALL BOXES THAT MATCH THE CHILD'S SYMPTOMS AND PROBLEMS TO CLASSIFY THE ILLNESS.

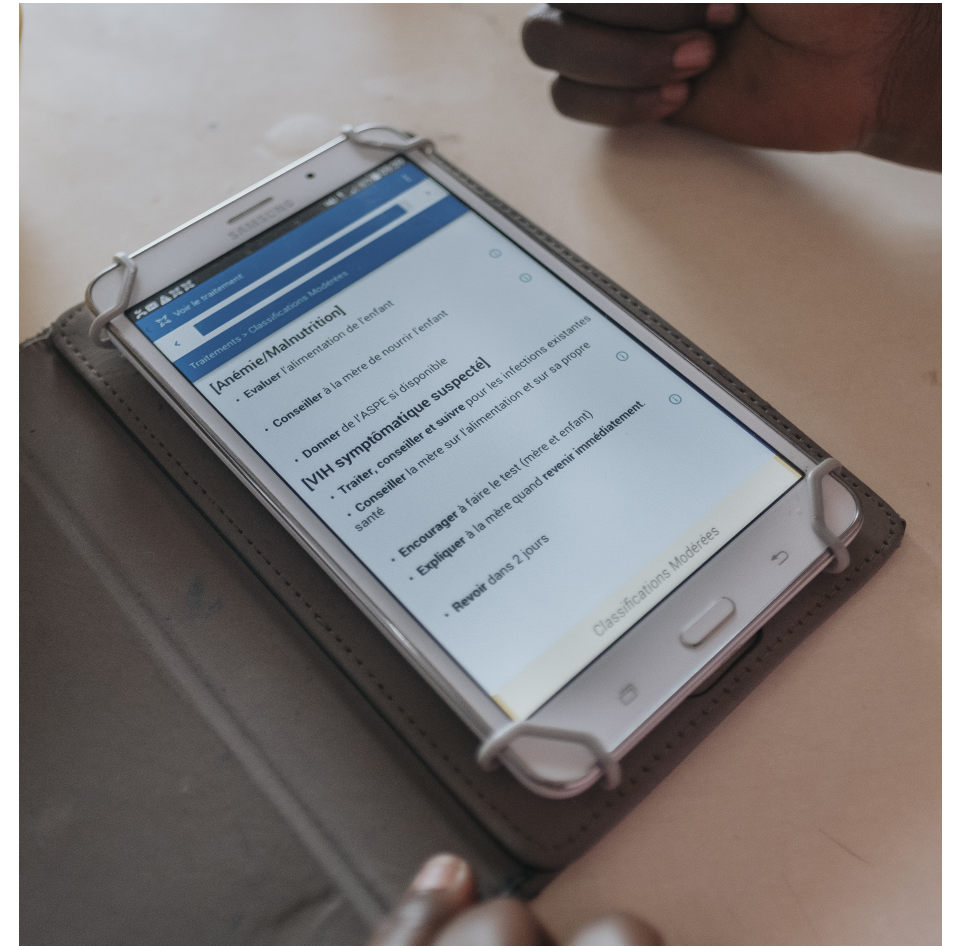
THEN ASK ABOUT MAIN SYMPTOMS:

Does the child have cough or difficult breathing?

IF YES, ASK:	LOOK, LISTEN, FEEL:	CLASSIFY AS	TREATMENT		
• For how long?	• Count the breaths in one minute. • Look for chest indrawing. • Look and listen for stridor. • Look and listen for wheezing. <i>If wheezing and either fast breathing or chest indrawing: Give a trial of rapid acting inhaled bronchodilator for up to three times 15-20 minutes apart. Count the breaths and look for chest indrawing again, and then classify.</i>	} CHILD MUST BE CALM	Classify COUGH OR DIFFICULT BREATHING		
			• Any general danger signs or • Chest indrawing or • Stridor in a calm child	SEVERE PNEUMONIA OR VERY SEVERE DISEASE	> Give first dose of an appropriate antibiotic > Refer URGENTLY to hospital*
			• Fast breathing	PNEUMONIA	> Give oral antibiotic for 3 days > If wheezing (even if it disappeared after rapidly acting bronchodilator) give an inhaled bronchodilator for 5 days** > Soothe the throat and relieve the cough with a safe remedy > If coughing for more than 3 weeks or if having recurrent wheezing, refer for assessment for TB or asthma > Advise the mother when to return immediately > Follow-up in 2 days
• No signs of pneumonia or very severe disease	COUGH OR COLD	> If wheezing (even if it disappeared after rapidly acting bronchodilator) give an inhaled bronchodilator for 5 days** > Soothe the throat and relieve the cough with a safe remedy > If coughing for more than 3 weeks or if having recurrent wheezing, refer for assessment for TB or asthma > Advise mother when to return immediately > Follow up in 5 days if not improving			

*If referral is not possible, manage the child as described in *Integrated Management of Childhood Illness, Treat the Child, Annex: Where Referral is Not Possible, and WHO guidelines for inpatient care.*

**in settings where inhaled bronchodilator is not available, oral salbutamol may be the second choice



Digitalisation of IMCI (Integrated Management of Childhood Illness)



Improving primary health care outcomes through mHealth



Terre des hommes
tdh.ch

1.6 M children consulted in 2018 in Burkina Faso, over 3 M expected in 2020



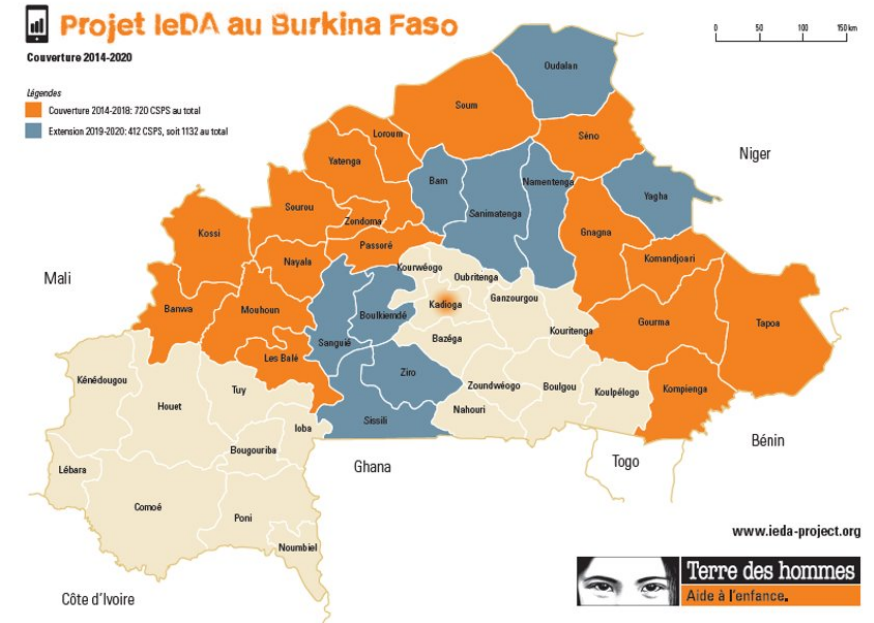
+1100 PHC implement leDA
(60% of PHCs)



2.5 million patients registered



Deployed in **Mali** (40 HCF)



5000+ active users



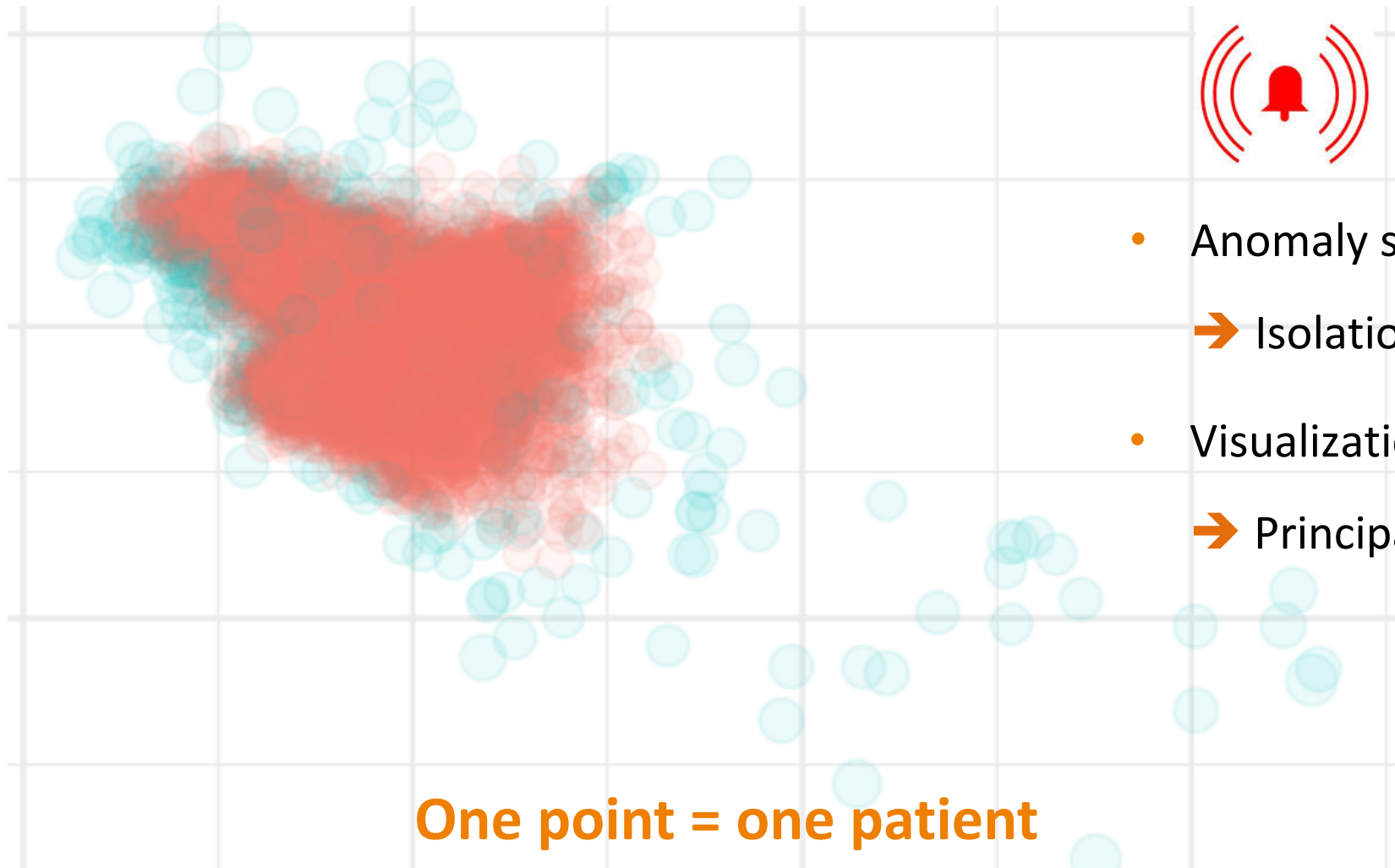
~250,000 consultations per
month on average,
5 million consultations to
date

The data science project

- Unique chance with database of millions of children of a single country
- Goals:
 - Evidence based epidemiological predictions
 - **Evidence based job-aid: reducing human errors**
 - Smart(er) dashboards for authorities



Outlier consultations: Degree of atypicality of a data point

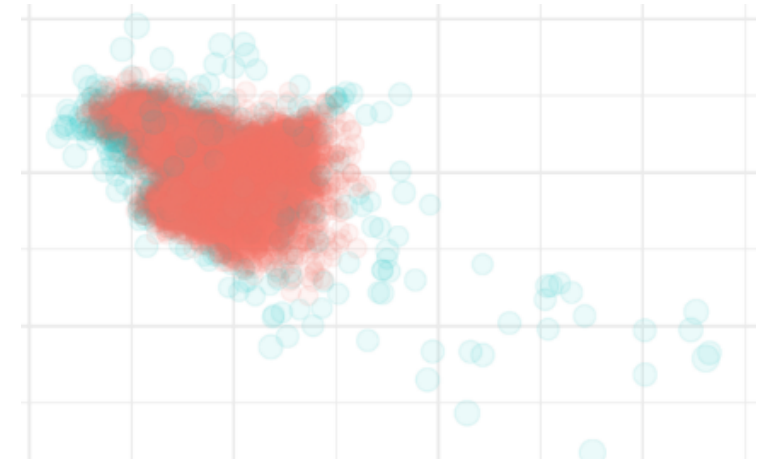
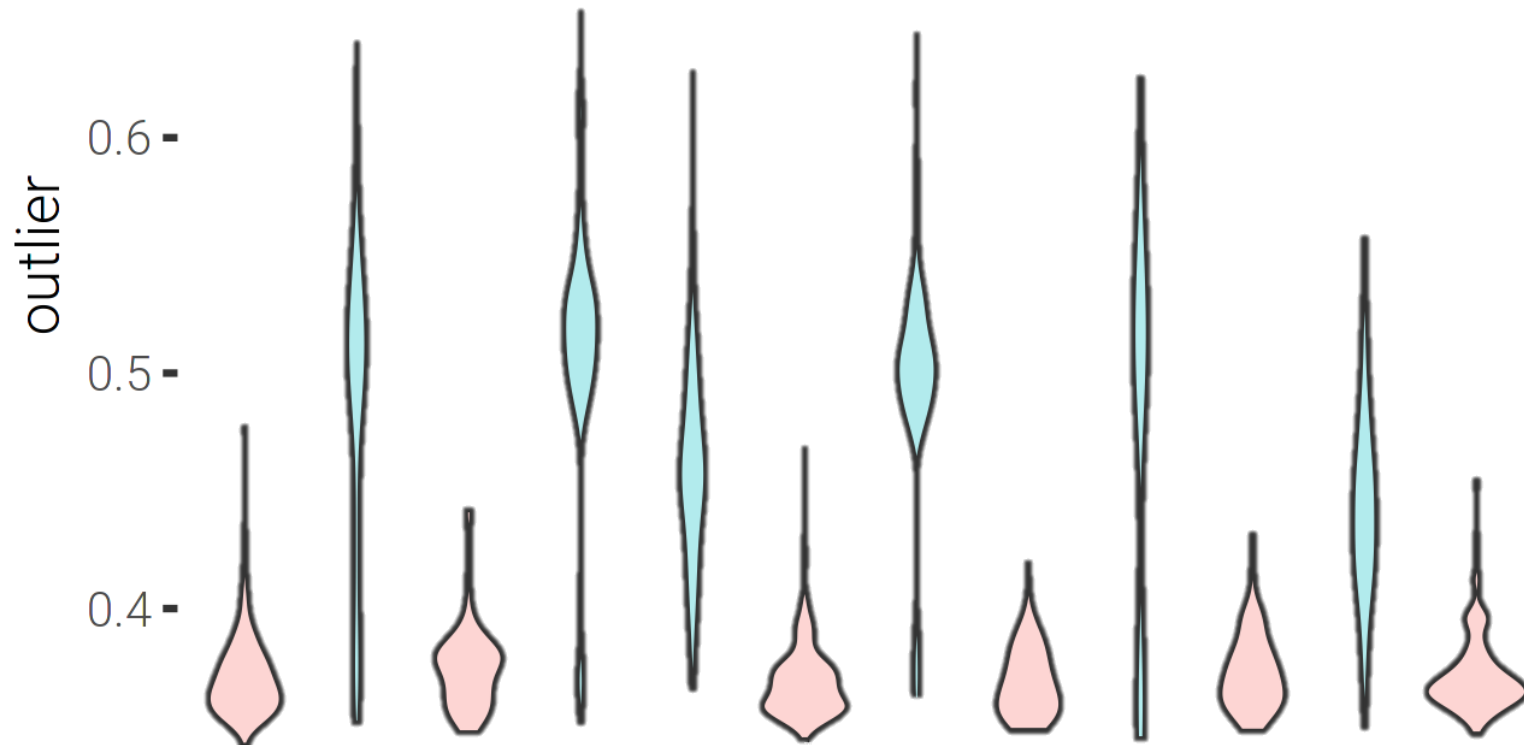


0.3% vs 99.7%

- Anomaly score of consultations
 - ➔ Isolation forest algorithm
- Visualization & interpretation
 - ➔ Principal Component Analysis

One point = one patient

Profiles of 12 FHW's based on their distribution of consultations



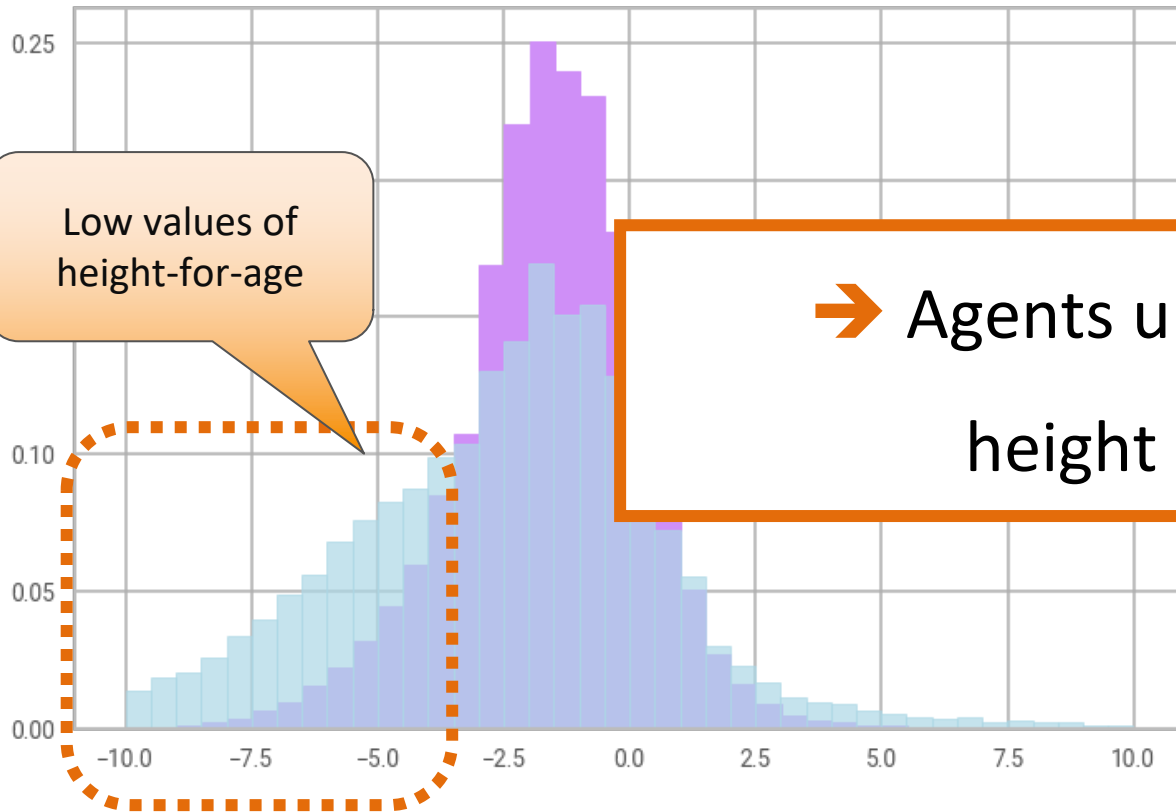
- **Red** : mostly typical consultations
- **Blue** : mostly atypical consultations!

- One bag = all consultations of one FHW → 12 bags shown
- Shape of bag indicates how often a FHW records an atypical consultation (outlier)

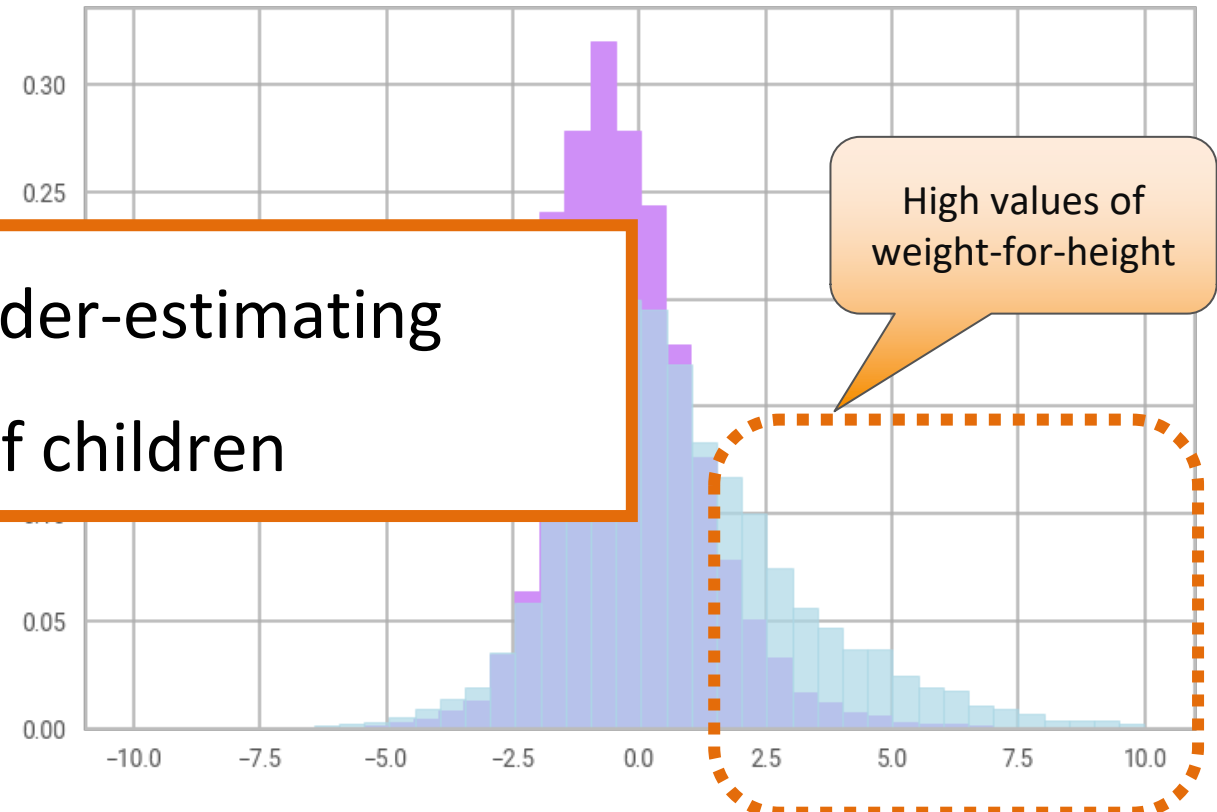
Back to data:

What distinguishes these two groups of FHWs?

Distribution of height-for-age z-scores



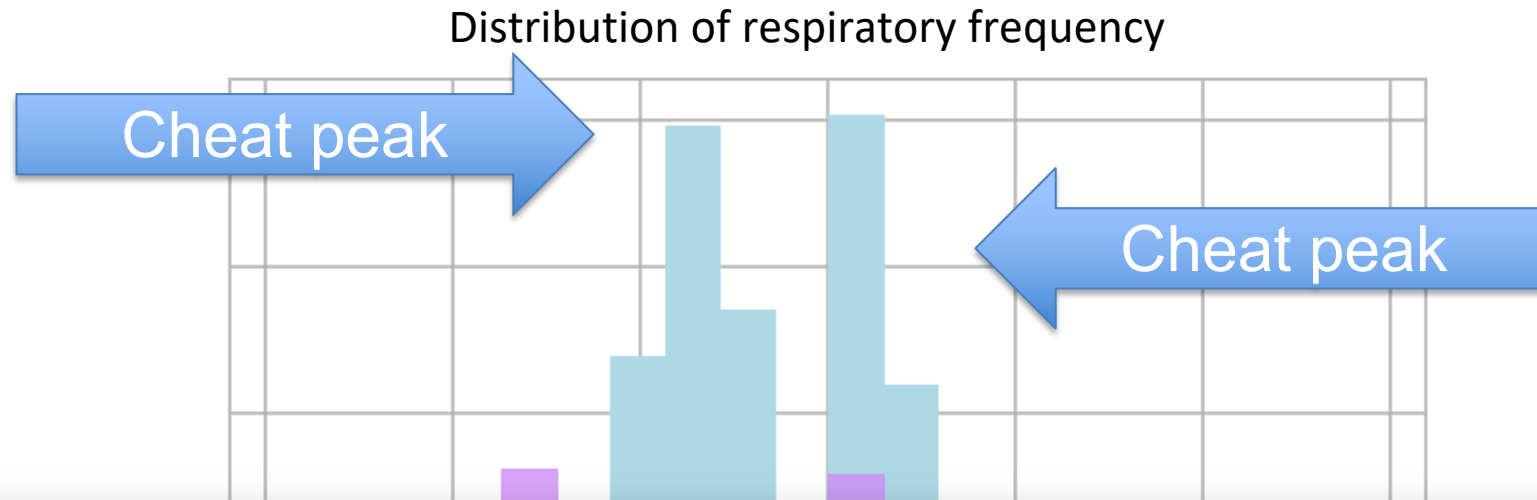
Distribution of weight-for-height z-scores



→ Agents under-estimating height of children

Outlier ≠ good or bad

What if most FHW's make the same mistake?



- FHW's know for which input values, the application will recommend antibiotics
- High respiratory rate is sign of pneumonia
- Social incentive to prescribe medicine, no matter what

Feedback and reports

- Direct alert during consultation:
- Personal usage report in app showing comparison to colleagues.
Ex. bronze, silver and gold **medals**

*“Please verify your
input for height”*



leDA

Mon 9:30 AM

Weekly Report Available

- You may have overprescribed antibiotics last week.

1

2

3

- Reports to facility and district manager:
Recommend targeted supervision & training for FHWs

Summary



- leDA: digital IMCI, fantastic data record for Burkina Faso
- Identify profiles of health workers by outlier study
- Include experts' knowledge to define reference health workers
- Strong interest from health workers and managers for feedback and insight



Thank you!

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