

Increasing the take-up of long-acting reversible contraceptives among adolescents and young women in Cameroon

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“How is this still a thing?”

- ▶ Startling fact #1:

- ▶ “Currently, almost half of the 6.7 million pregnancies in the United States each year are unintended.” ([*MDRC's ICON project*](#))

- ▶ Even more startling fact #2:

- ▶ 48% of unintended pregnancies in the US occur in the same month when contraception is used (*Finer and Henshaw 2006*)

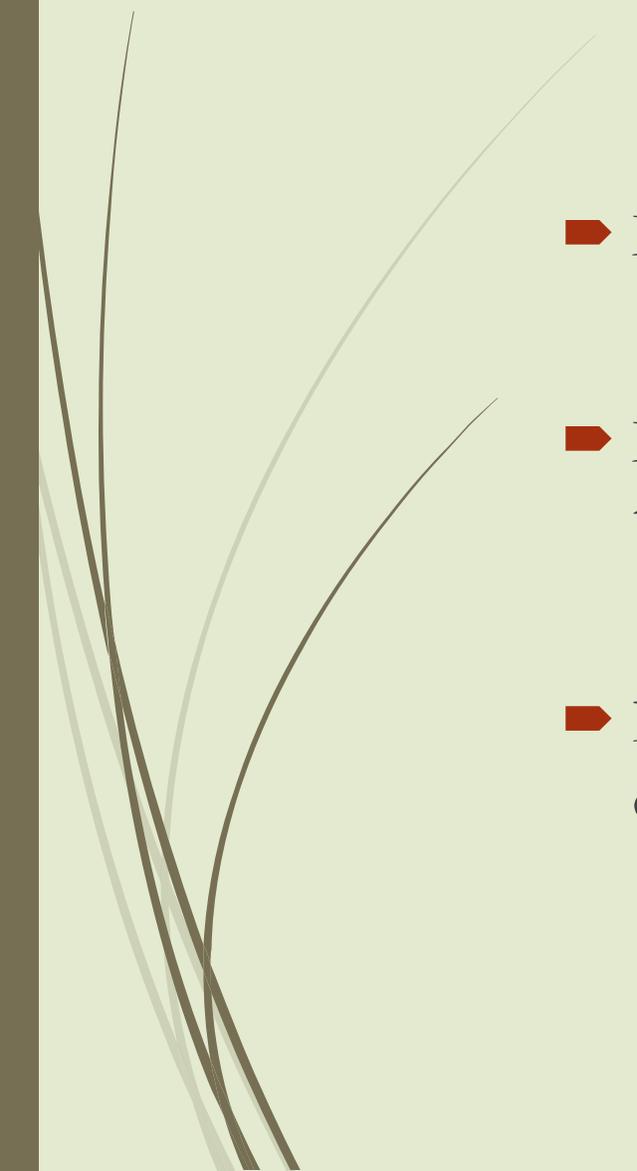


Why is this important?

- ▶ Maternal mortality ratio $\cong 600$ (*per 100K live births*)
- ▶ Lifetime risk of maternal death $\cong 1$ in 35
- ▶ Unintended pregnancies are a major factor in persistently high maternal mortality...



Why is this important?

- Loss of welfare for the mother
 - Low age at first birth → negative impacts on the spacing of births & timing of future pregnancies.
 - Reduced accumulation of human capital for both the mother & the child.
- 



It's not like the technology does not exist...

- ▶ Long-acting reversible contraceptives (LARCs) are close to 100% effective in preventing unintended pregnancies.
- ▶ But, no one is using them (*at least until very recently*)
 - ▶ Especially in developing countries
 - ▶ Even more true for:
 - ▶ Adolescent females
 - ▶ Unmarried women, and
 - ▶ Nulliparous women



Interventions to maximize human capital accumulation among adolescent females

- Of the interventions, say, the World Bank supports (and others that you can think of), such as:
 - CCTs/UCTs,
 - Girls' clubs,
 - Vocational training, etc.
- It's quite possible that an effective intervention to increase the uptake of modern contraceptives would be the most cost-effective option...
 - **But, what would such an intervention look like?**



It's a complicated problem...

- **Big picture:** There exists no contraceptive method that is highly effective, convenient to use, and has, on average, minimal side effects.
 - Worse, the side effects are highly idiosyncratic.
 - So are individual preferences...
 - A journey to find the right method for you (for a period of time)
- **Smaller picture:** Supply- and demand-side problems galore...
 - Lack of training and provider bias
 - Misinformation, fear, culture, religion
 - Cost

Redefining the “counseling approach”

➤ **Old/current paradigm for FP counseling:**

- “An informed choice model in which individuals are given extensive information to make their own independent choices.”
 - “Tell the client about **ALL** the methods and let her make a decision.”

➤ **New paradigm/destination :**

- Shared decision-making based on the client’s goals, needs, and preferences
- Still patient-centered (respectful, empathetic, and confidential), while hopefully more efficient and realistic (Hoyt et al. 2017)
 - “Elicit client’s preferences, goals, needs, as well as her birth and medical history, and make a recommendation.”

FP3.0 - A Tablet-based Counseling “App”

 Press here to begin

I, the health provider, confirm each of the following:

INSTRUCTION
You (the health provider) must complete each task below and confirm by checking the box next to it. You can only continue with the session after you have checked all three boxes.

- I welcomed the client, took steps to ensure a private setting for the counseling session, and commended her for coming in today
- I explained the purpose of the session, which is to talk about her life and goals, healthy families, pregnancy spacing, safe sex, and contraceptive methods
- I explained to the client that she can always ask questions and should speak freely, as this meeting is completely confidential. I also explained to her that she can stop this session at any time for any reason.

Are you ready to go on with counselling?

yes 

No

 Press here to begin

INSTRUCTION
If the patient is currently pregnant, please count it in these pregnancies.

4 

How many abortions have you had?

1 

How many biological living children do you have?

3 

What was the date of your most recent delivery (live or still)?

INSTRUCTION
If the client gives a range rather than an exact date, enter the most recent date of that interval

2018-12-10 

FP3.0 - A Tablet-based Counseling “App”

 Consultation

What issues are you having with IUD?

- Inconvenient (forgot to take pill, facility far to refill)
- Side effects (headache, bleeding, acne, weight gain.)**
- Cost of method
- Other (not discrete, ineffective..)

What are the side effects?

- headaches (migraines)**
- bleeding**
- acne
- weight gain
- discomfort**
- others (not specified)

 Consultation

Some women experience changes in their menstrual period after they start using a method of family planning. Other than rare occasions, these changes are normal, and are not a sign that the method is harmful to your health. Some women who use contraceptive implants and injectables stop having a menstrual period and this is not harmful either. None of the methods we will discuss affect your ability to conceive in the future: you can always stop using the method and try to get pregnant right away. Let's talk about some of the more common things you may experience.

Some methods can cause increased menstrual bleeding and cramping, though this effect subsides for most women after the first three months. How important is it to you to minimize the chances of increased cramping or bleeding in the early stages of adopting a method?

INSTRUCTION
Please read out the answer choices to the patient

- NOT important
- Somewhat important
- Very important** 

Some methods cause decreased menstrual bleeding over time with some women eventually not having a period at all. As we mentioned before, absence of bleeding is definitely not harmful to your health. In fact, some women like you consider this to be convenient and it is an added health benefit. How important is it to you to maximize the likelihood of maintaining your period?

FP3.0 - A Tablet-based Counseling “App”

Consultation

Are you taking any of the following drugs?

INSTRUCTION
Please answer this question to continue

Anti retroviral (ARV)

TB drugs (such as rifampicin)

Barbiturates (such as phenytoin)

none

Do you experience unexplained vaginal bleeding?

INSTRUCTION
Record if client has unexplained vaginal bleeding

Yes

No

Allow us to take your blood pressure

INSTRUCTION
Enter SYSTOLIC BP reading

Method choice

WARNING: the PILL - POP is contraindicated for this patient at this time
- Patient is taking TB drugs or barbiturates

WARNING: the PILL - COC is contraindicated for this patient at this time
[...]
[...]
- Patient has a history of hypertension OR systolic bp >=140 or diastolic bp >=90
- Patient is taking TB drugs or barbiturates

WARNING: the INJECTABLE is contraindicated for this patient at this time
[...]
[...]
- Patient has systolic bp >=160 OR diastolic bp >=100
[...]

Method: IMPLANT

Section not started

COMPLETE INTERVIEW

FP3.0 - A Tablet-based Counseling “App”

METHOD CHOICE /
Method: IMPLANT

OK, based on our conversation, there are two equally great methods that might fit your goals, needs, and preferences. However, is it ok if we start by discussing the IMPLANT, so that you can understand how it works, its advantages and disadvantages? If you don't like the IMPLANT, then we can always talk about the other method. I am sure that we can find something suitable for you.

Yes No

Pull the cue card for **IMPLANT** from the stack, and put it in front of you and the client, leaving the others on the table.

Go over the information on the front side of the cue card for the IMPLANT, discussing what it is, how it works, and emphasizing its effectiveness and advantages. Pause to see if the client is content with what she has heard about the IMPLANT so far and answer any questions she may have.

If the client is happy to continue, please turn over the cue card and go over the information on the back of it, emphasizing how it is used and administered, possible side effects, and reasons to return to the provider. Again, pause to see if the client is content with what she has heard about the IMPLANT so far and answer any questions she may have.

If at any point, the client no longer wants to hear about this method and rules out adopting it, please move to the next question, select "No, the client does not wish to adopt this method", and record the main reason(s) why.

Method choice

Would the client like to adopt the IMPLANT?

Yes, the client would like to adopt the method Peut etre, mais la cliente veut discuter d'autres methodes No, the client does NOT want to adopt the method

Please proceed to administration of IMPLANT or (in case of a circumstance that prevents administration immediately) please make an appointment for a future date of administration of method.

Please confirm whether the client received the IMPLANT before leaving the facility?

Yes No

Why did the client not leave with this method?

INSTRUCTION



Advantages of FP3.0

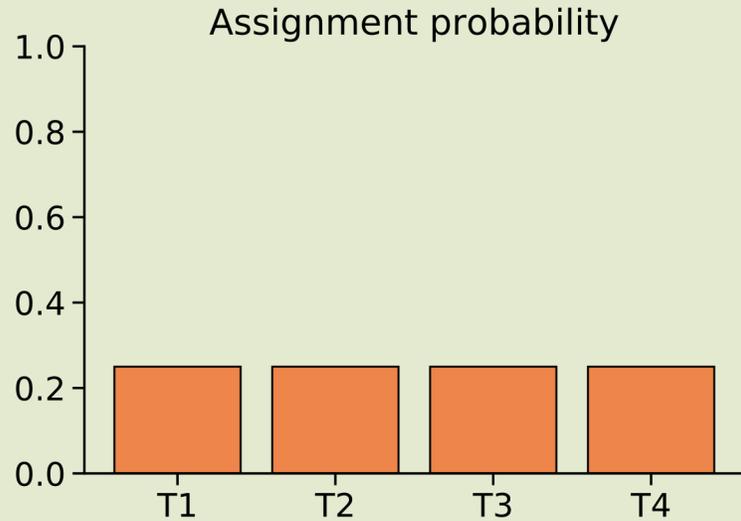
- Makes the nurse's job easier
 - Empowers the client
 - Produces rich data on client characteristics, preferences and outcomes
 - And, allows for experimentation...
- 



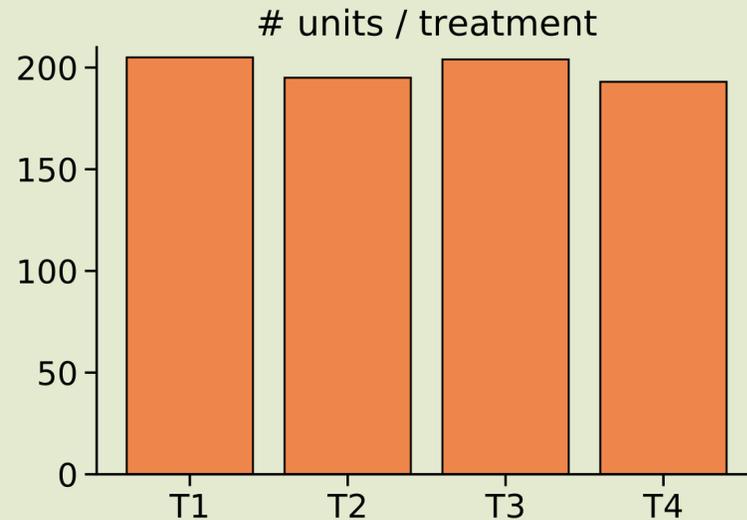
An adaptive experiment...

- ▶ Trying to increase the uptake of LARCs – particularly among adolescents and nulliparous/unmarried women – by:
 1. Randomly vary the **counseling approach** (mimicking the old and the new paradigms within the “app”)
 2. Offering random discounts to learn about the (cross-) **price elasticity** of demand and its heterogeneity by context
- ▶ Tailoring counseling to the client (*using contextual bandit algorithms*)

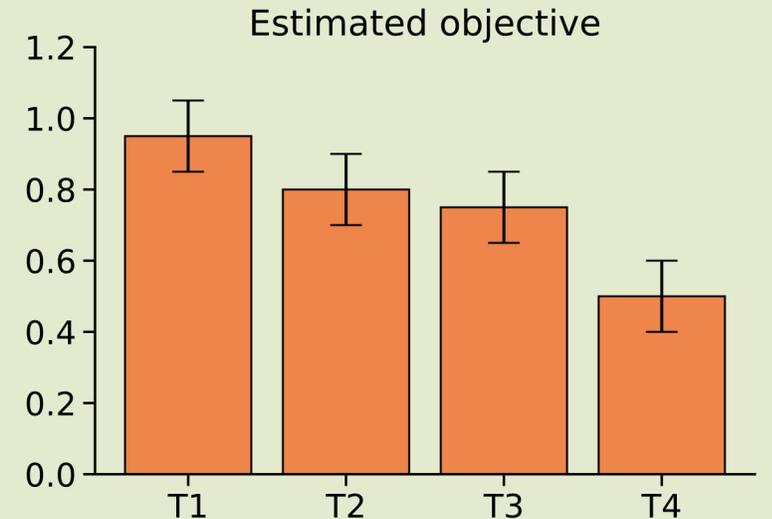
Randomized control trials



Fixed probability of assignment to each treatment*.



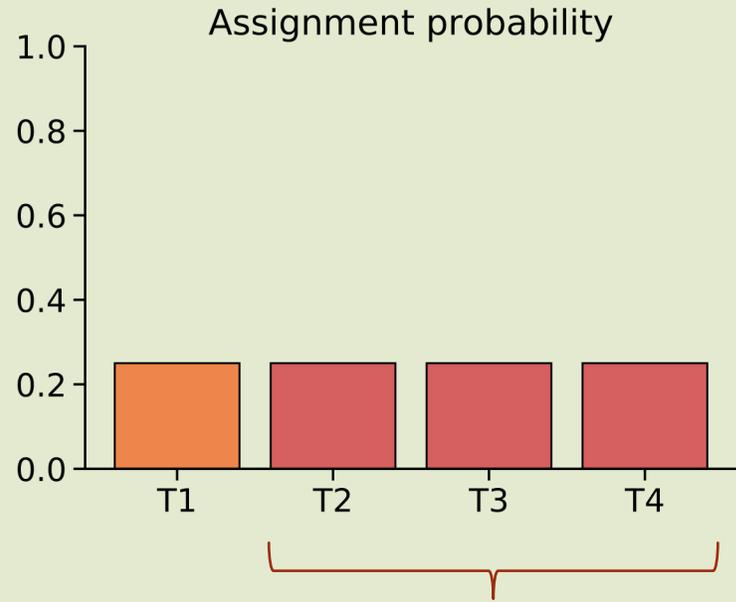
Roughly equal number of units assigned to each treatment.



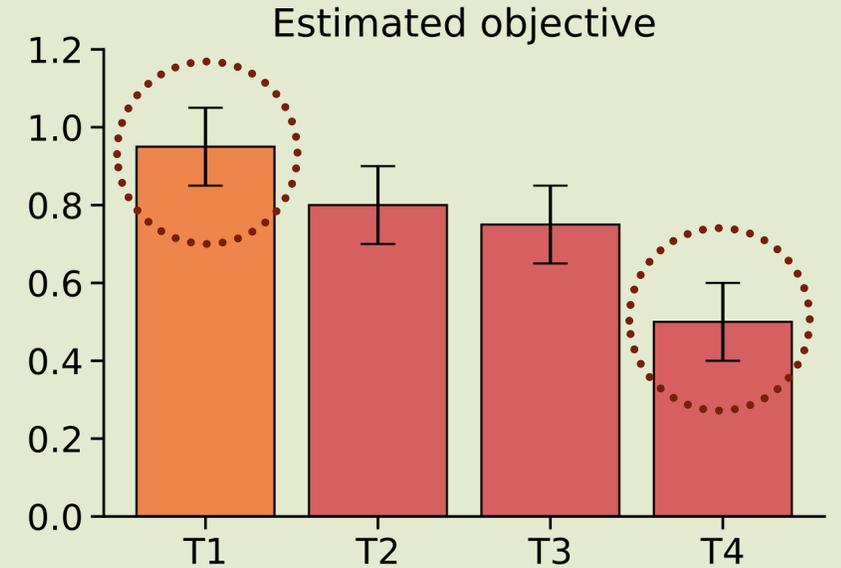
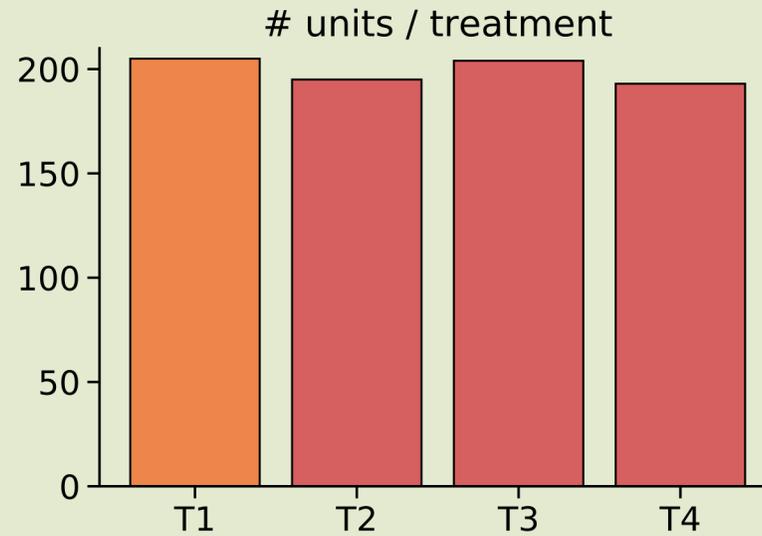
Treatment value estimate

*Note: for illustration only. In our experiment there are 20 treatments.

Randomized control trials



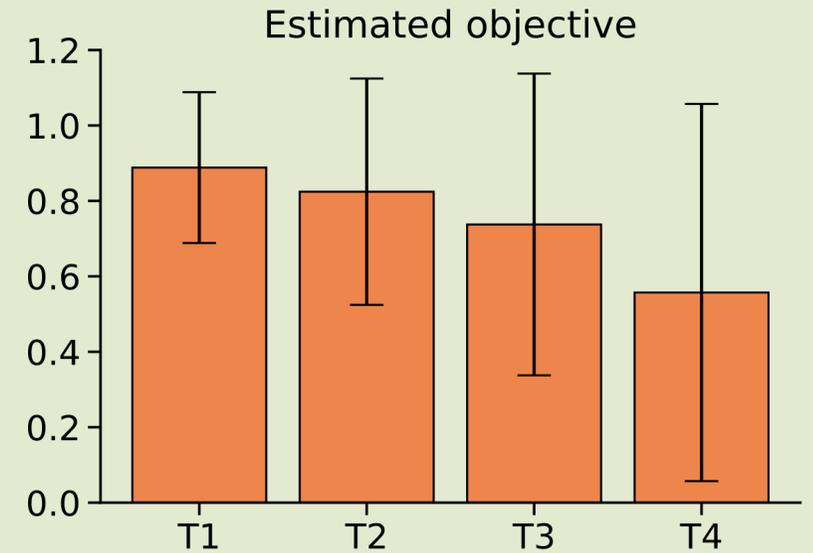
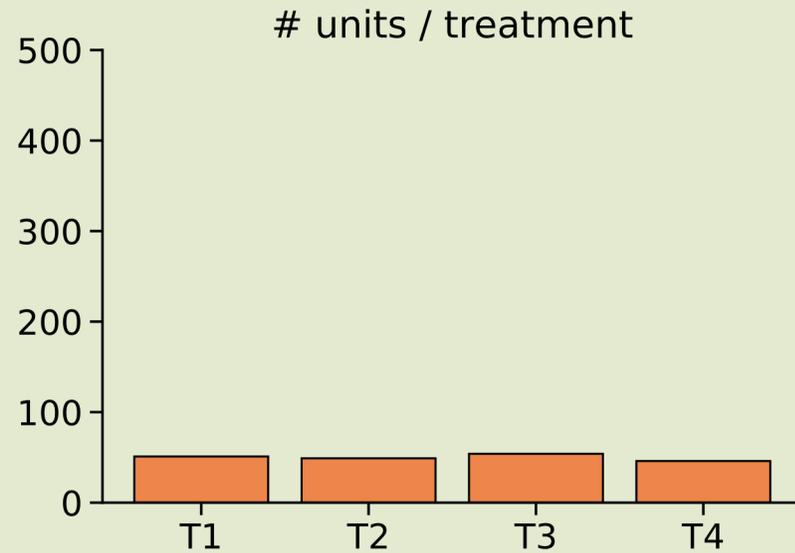
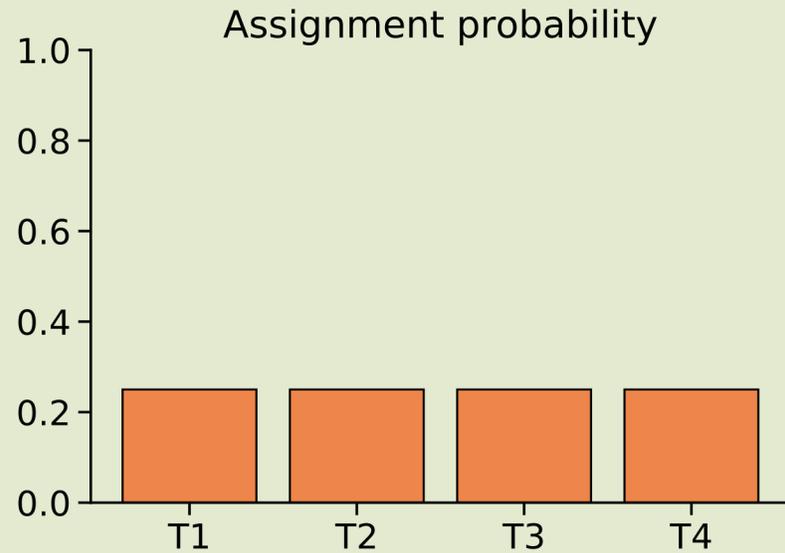
Many individuals assigned to suboptimal treatments (**regret**).



Good treatments not necessarily estimated more accurately than bad ones.

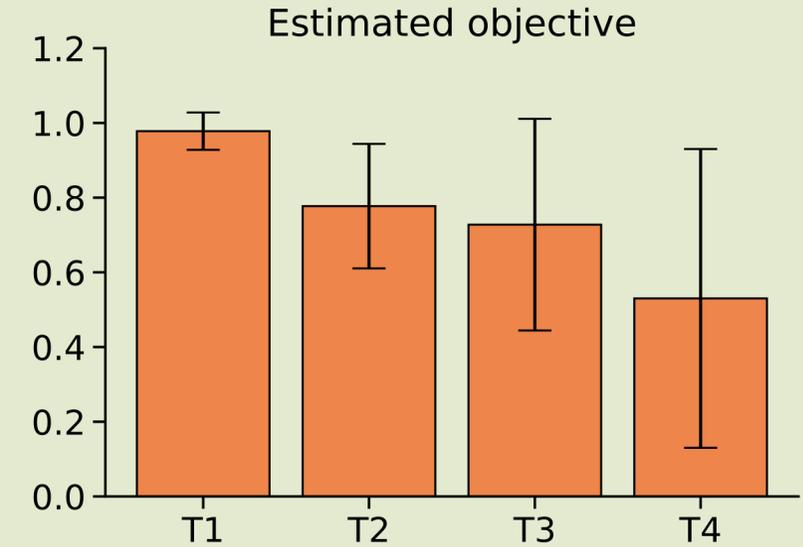
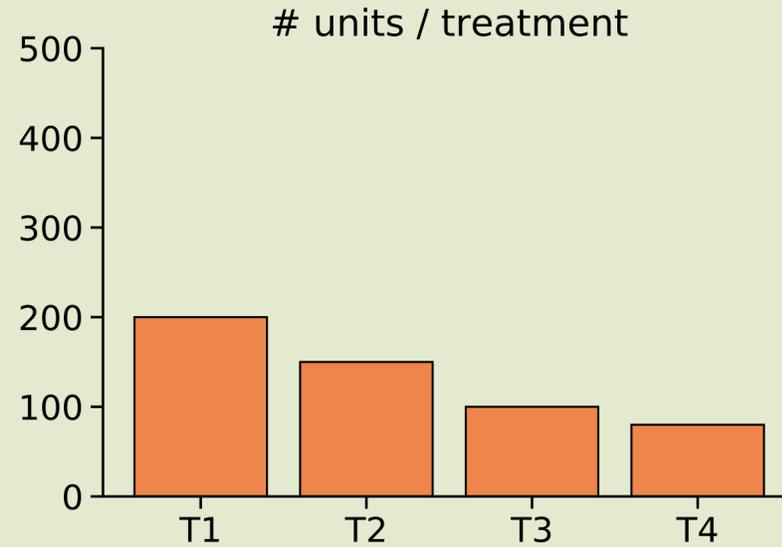
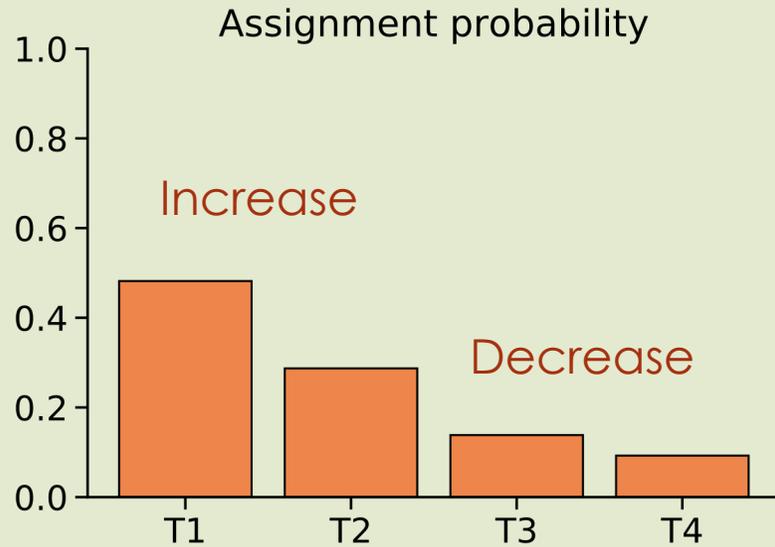
Adaptive experiments

(multi-armed bandits)



Step 1: At the *beginning* of the experiment, assign treatments uniformly at random

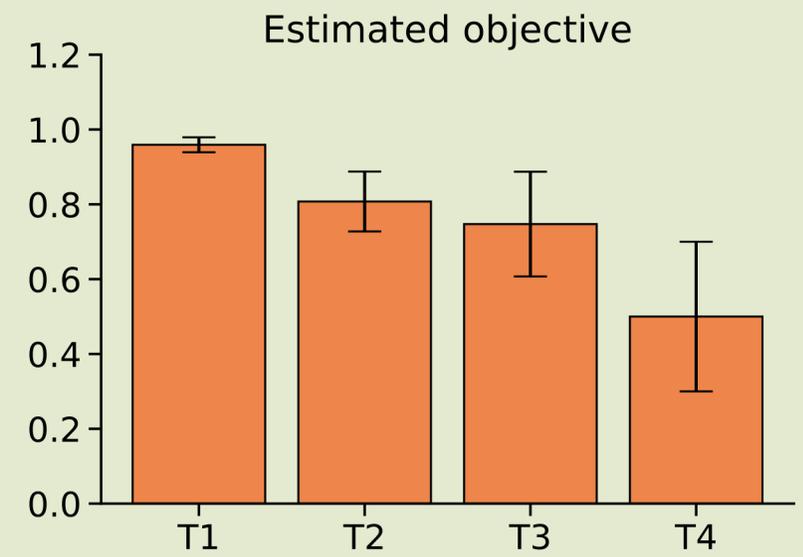
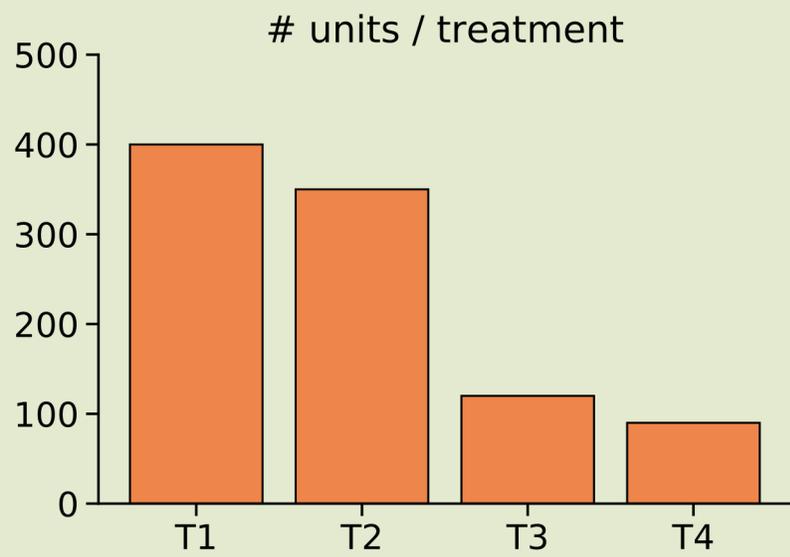
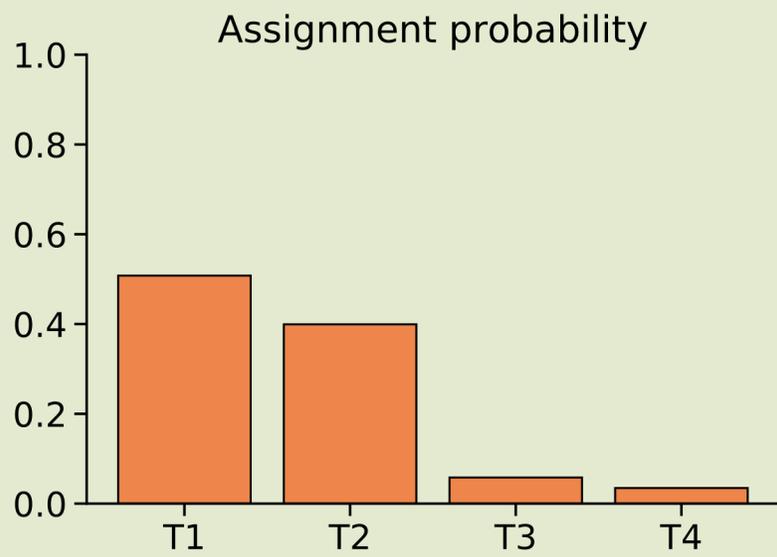
Adaptive experiments (multi-armed bandits)



Step 2: Once some data has been collected, **increase** the probability of assignment to more **promising arms**.

Adaptive experiments

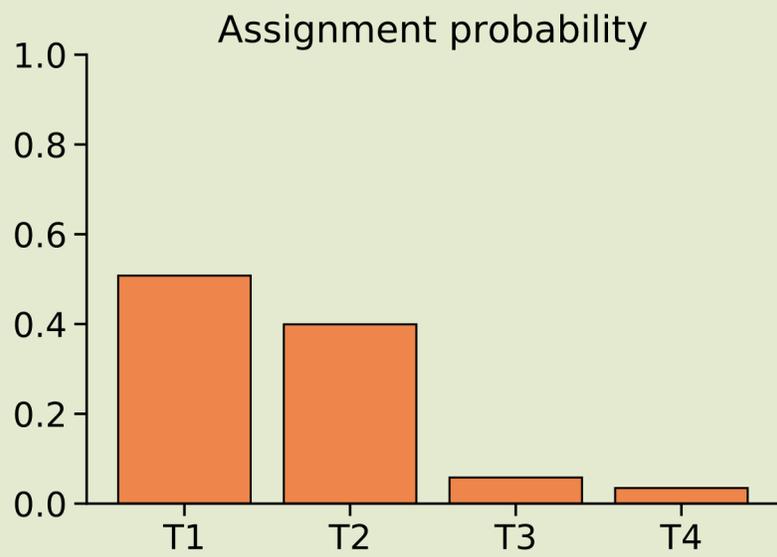
(multi-armed bandits)



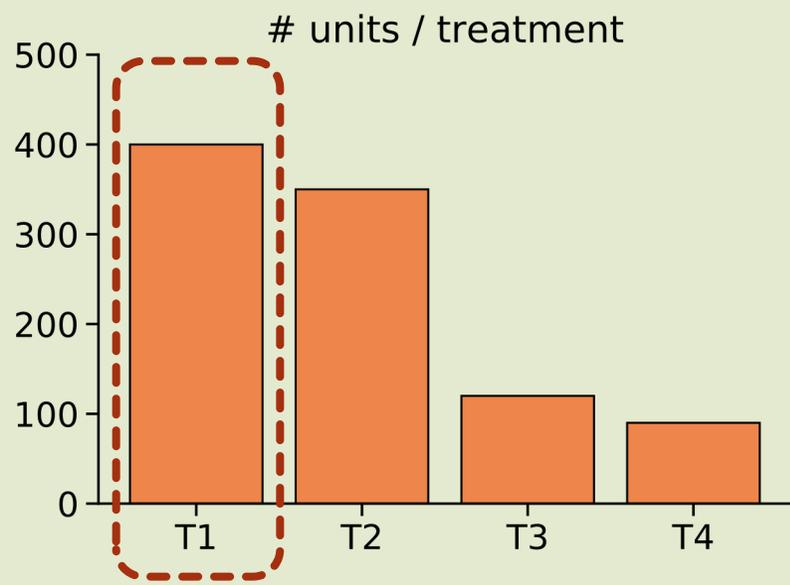
Step k: Repeat this procedure in batches, increasing probabilities one assignment as we become more certain about which treatments are good.

Adaptive experiments

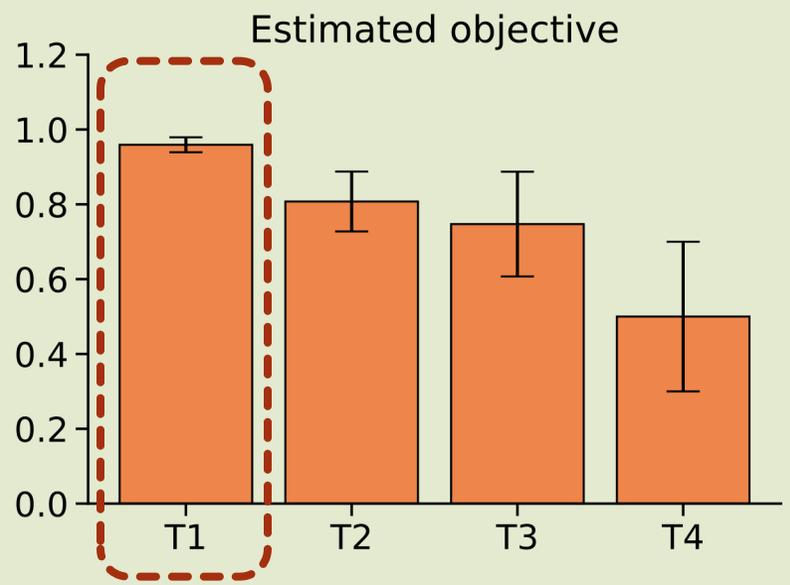
(multi-armed bandits)



As experiment progresses, suboptimal treatments are assigned less frequently...

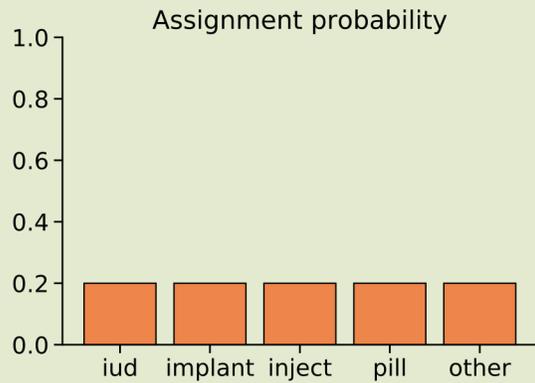


...in the end, more observations assigned to optimal treatments (lower **regret**).



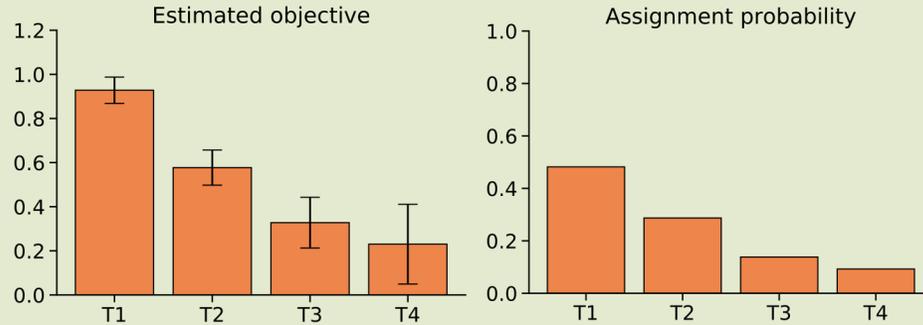
Tighter confidence intervals around optimal treatment value estimates (more **power** for hypotheses about better treatments).

Adaptive experiments (contextual bandits)

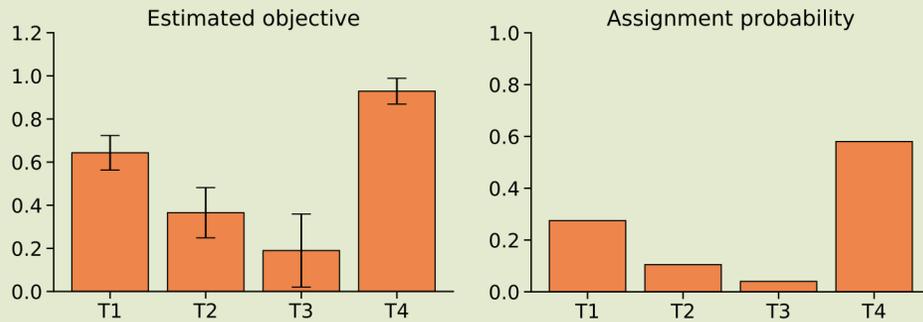


Step 1: Treatments assigned uniformly at random.

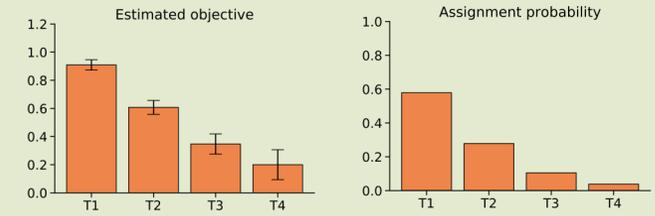
Age ≤ 26



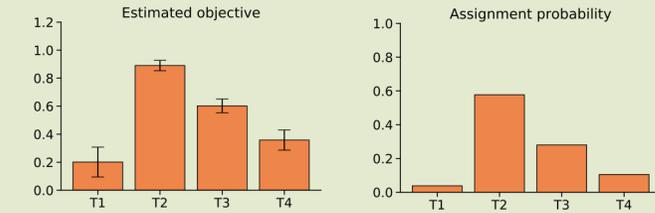
Age > 26



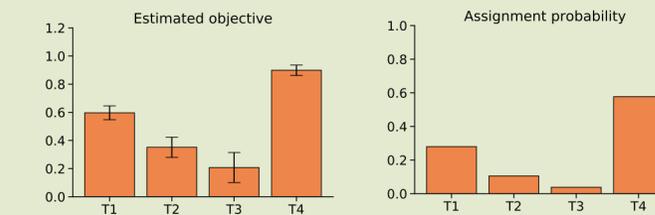
Age ≤ 22 and children ≤ 2



Age > 22 and children ≤ 2



22 \leq Age < 28 and children > 3



(...etc....)

Step 2: Using *contextual* (personal) information, discover *subgroups* and update assignment probabilities for each group.

Step k: Retrain algorithm, discover more refined subgroups. Update probabilities to increase *personalization*.

time





Contextual bandits

- ▶ Tailoring the treatment to the individual client:
 - ▶ Random assignment probability not only depends on success (reward) in previous batches, but also on the individual characteristics (context) of the individual.
 - ▶ Best treatment in each subgroup can be estimated more accurately.
 - ▶ However, new statistical inference challenges due to adaptivity (e.g. *Hadad et al, 2019; Deshpande et al, 2017*)
- ▶ In our adaptive experiment, we are trying to minimize the probability of unintended pregnancies within 12 months for a given budget.
 - ▶ We are in the process of identifying a few contexts (adolescent/adult; married/unmarried; nulliparous/higher parity, etc.)

The pilot phase has begun :-)

