

Screening and Prevention of Colorectal Cancer

Future Strategies for the European Union from Taiwan's Experience

Han-Mo Chiu, MD, PhD

Clinical Professor, Department of Internal Medicine, National Taiwan University Hospital

Principal Investigator, Taiwan Colorectal Cancer Screening Program

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Why Taiwan's experience matters for the EU now



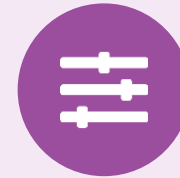
2022 Council Recommendation

CRC screening at ages 50–74 with quantitative FIT before colonoscopy



Uneven implementation

FIT cut-offs, age ranges, coverage and colonoscopy capacity vary widely

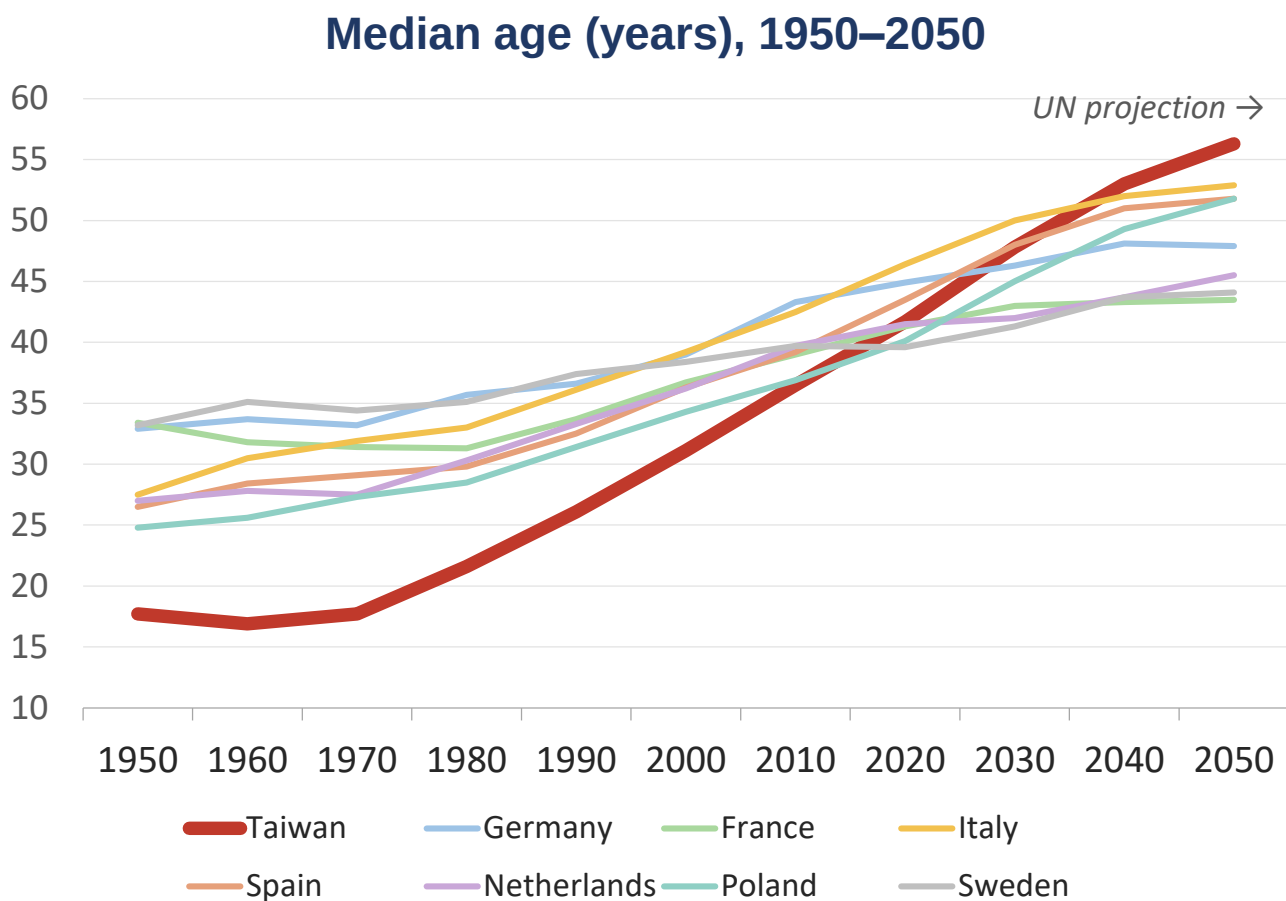


Toward risk stratification

EUCanScreen and the EC initiative are testing personalised screening

Taiwan: 20 years of an organised FIT program, with linked screening, registry and claims data

Taiwan and the EU: similar populations, similar pressures



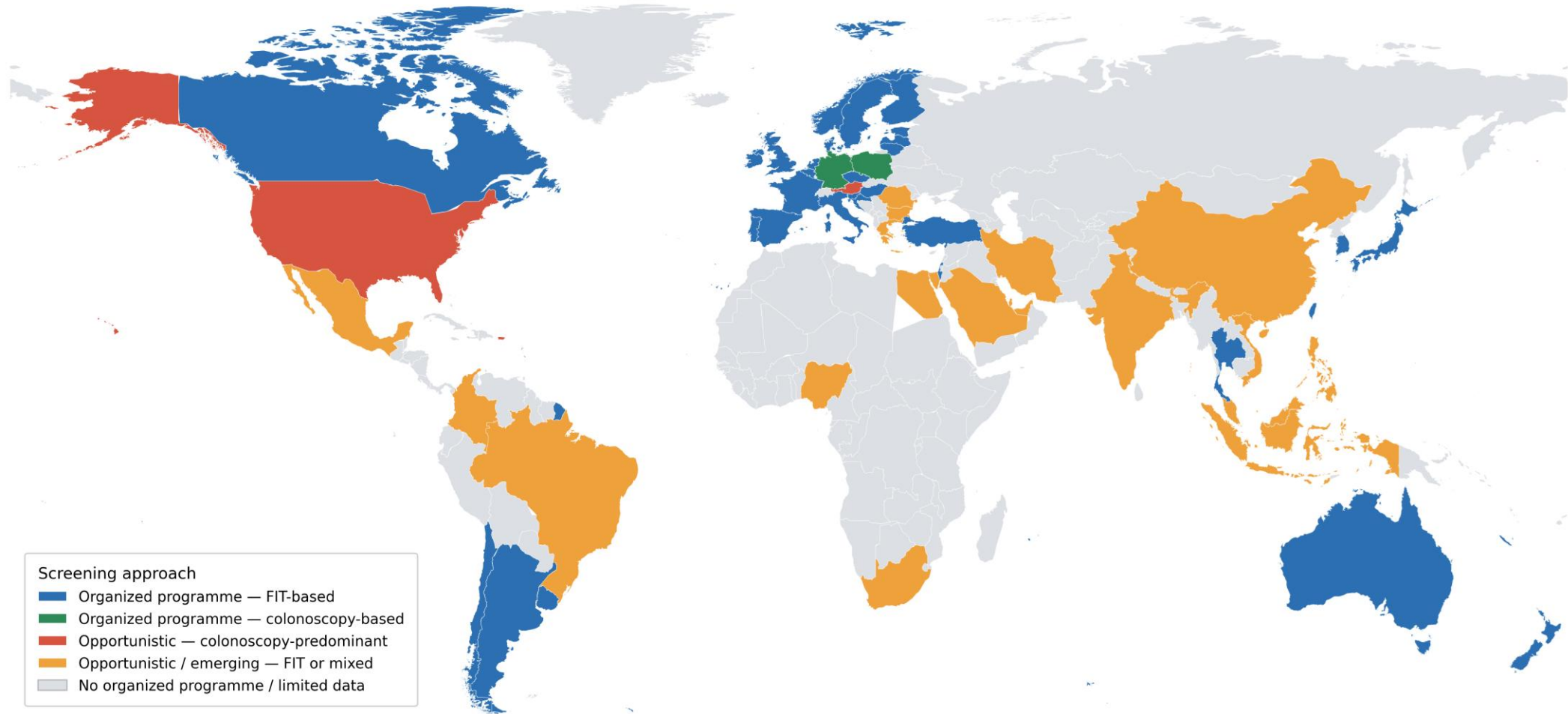
	Taiwan	7 EU countries*
Median age, 2023	43.5	39.9 – 47.5
Life expectancy, 2023	80.6	78.6 – 83.7
GDP per capita, 2022†	53,100	32,500 – 49,700
Old-age dependency, 2023‡	26.2	29.9 – 38.0
Fertility rate, 2023	0.87	1.20 – 1.64
Median age, 2050 (proj.)	56.3	43.5 – 52.9

As old and as wealthy as the EU, and ageing faster

Our World in Data: UN World Population Prospects 2024; Maddison Project Database 2023. *Germany, France, Italy, Spain, Netherlands, Poland, Sweden.
†International-\$ (2011 prices). ‡Aged 65+ per 100 aged 15–64.

Global Landscape of Population CRC Screening

Stratified by how the screening service is delivered and by the primary screening tool



Modified from: Chiu HM et al. Nat Rev Gastroenterol Hepatol 2026 (Accepted)

Organized vs. opportunistic CRC screening Program

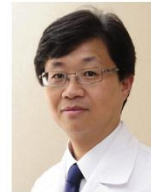
As per the definition by IARC:

1. An explicit policy with specified age categories and methods and intervals for screening
2. A defined target population
3. A management team responsible for implementation
4. A health care team for decisions and care
5. A quality assurance structure
6. A method for identifying cancer occurrence in the population.

International Perspective on the Burden of Colorectal Cancer and Public Health Effects



Linda Rabeneck^{1,2}



Han-Mo Chiu³

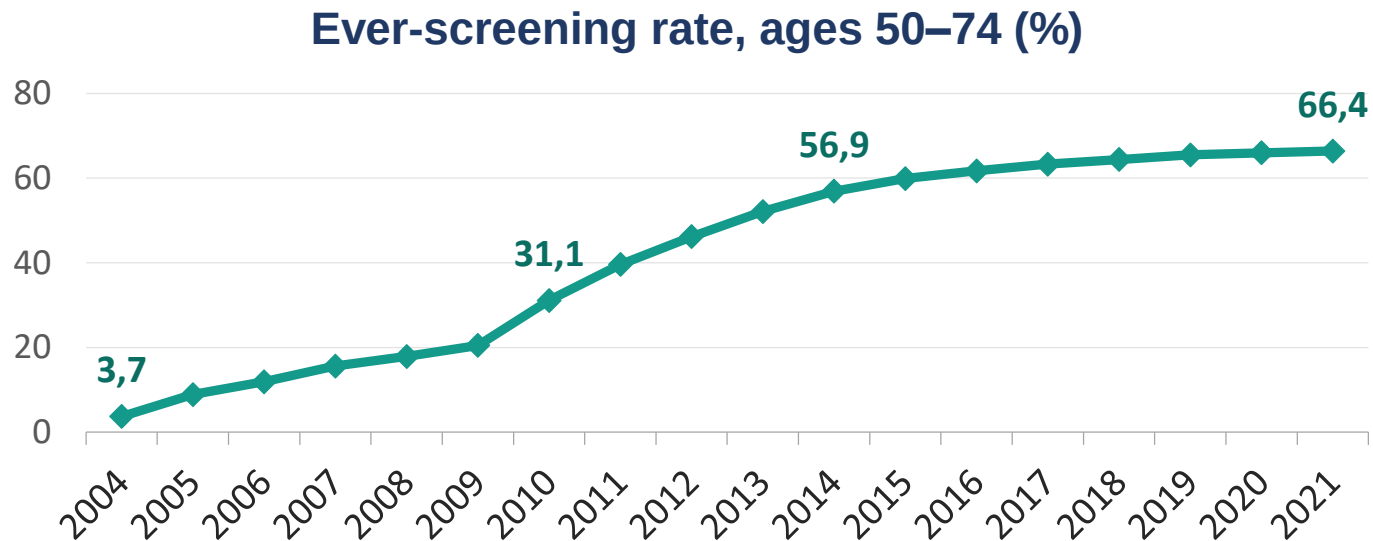
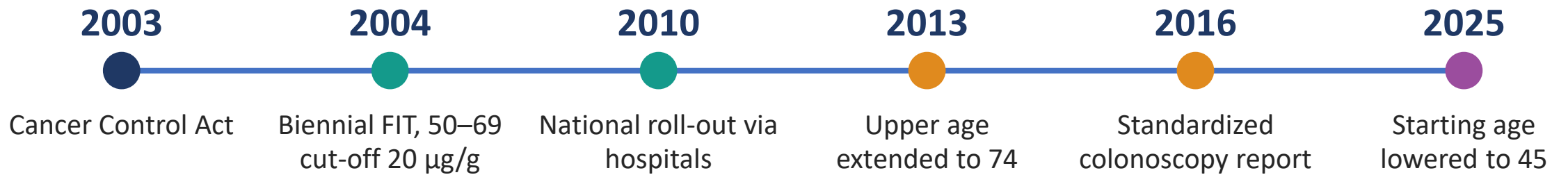


Carlo Senore⁴

Gastroenterology 2020;158:447–452

- Focuses much greater attention on the quality of each step in the screening process:
 - *Follow-up of participants*
 - *Reports publicly on cancer screening program performance*
- Key advantage of organized screening is providing greater protection against the harms of screening:
 - *Over-screening*
 - *Poor-quality and complications of screening*
 - *Poor follow-up of those with positive test results*

Two decades of Taiwan's CRC screening program at a glance



5.4 M

people screened,
2004–14

7.0% / 6.4%

FIT positivity, first /
later rounds

70%

colonoscopy
completion after FIT+

2.2

CRCs per 1,000 FITs
(first round)

Three pillars of our work



PROVE

Evaluating the effectiveness of CRC screening

Does FIT screening reduce CRC incidence and mortality at population level?



ASSURE

Ensuring the quality of colonoscopy

Does the colonoscopy step deliver what the FIT promises?



PERSONALISE

f-Hb for precision CRC screening

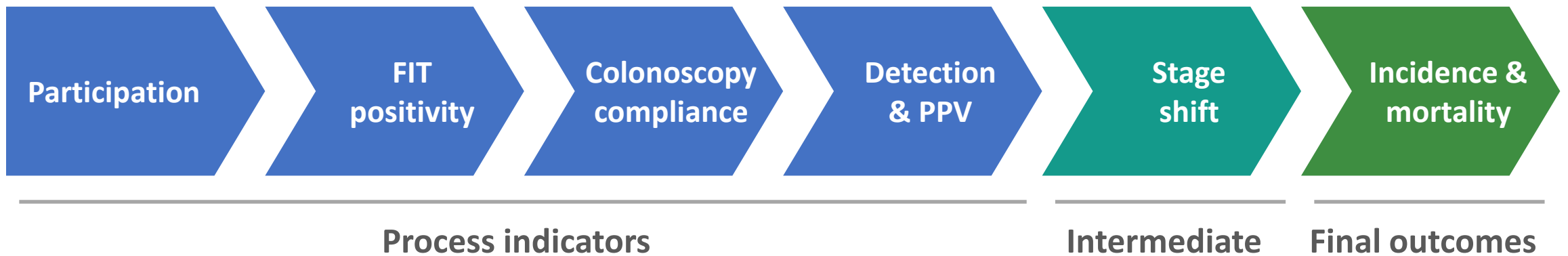
Can the quantitative FIT result tell us who, when and how to screen?

PART 1

Prove

Evaluating the effectiveness of CRC screening

From process to outcome: how we evaluate the program

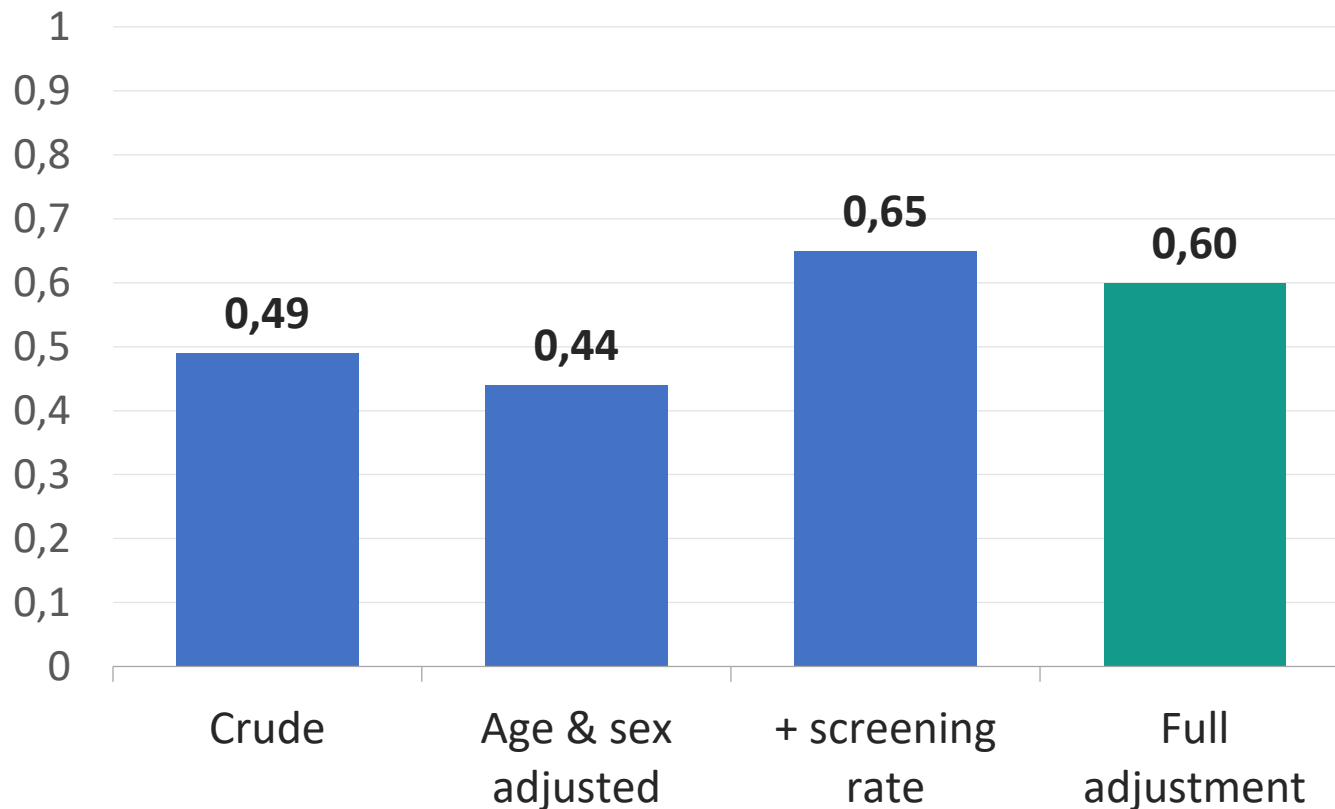


Linked by national ID, each with >99% coverage



Without an RCT: correcting for self-selection

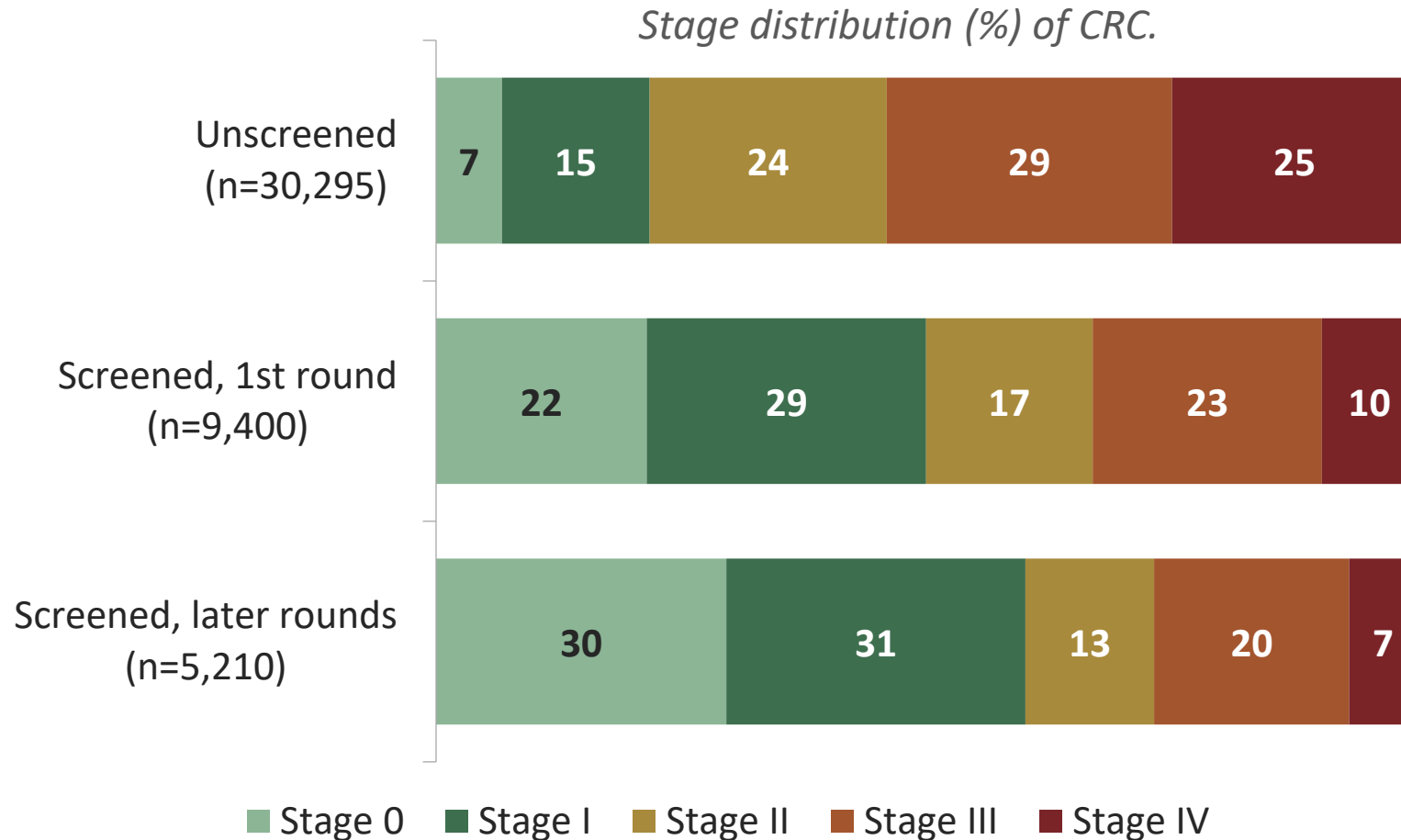
RR of CRC death, invited vs uninvited



Design

- Phased roll-out created an invited vs uninvited comparison
- 3.07 M invited vs 2.35 M uninvited, 2004–14
- Corrected for self-selection and the secular trend in CRC
- Early phase: crude RR 0.38 → adjusted 0.90

Short-term outcome: a clear stage shift



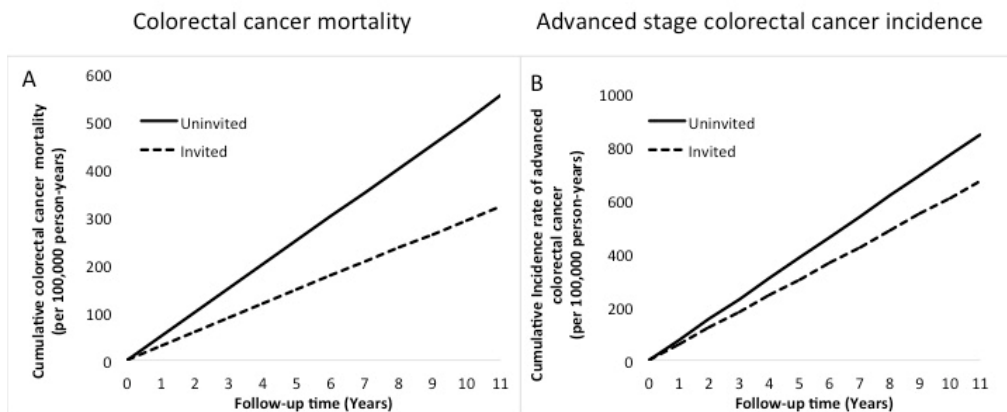
22% → 53%

stage 0–I, unscreened vs screened

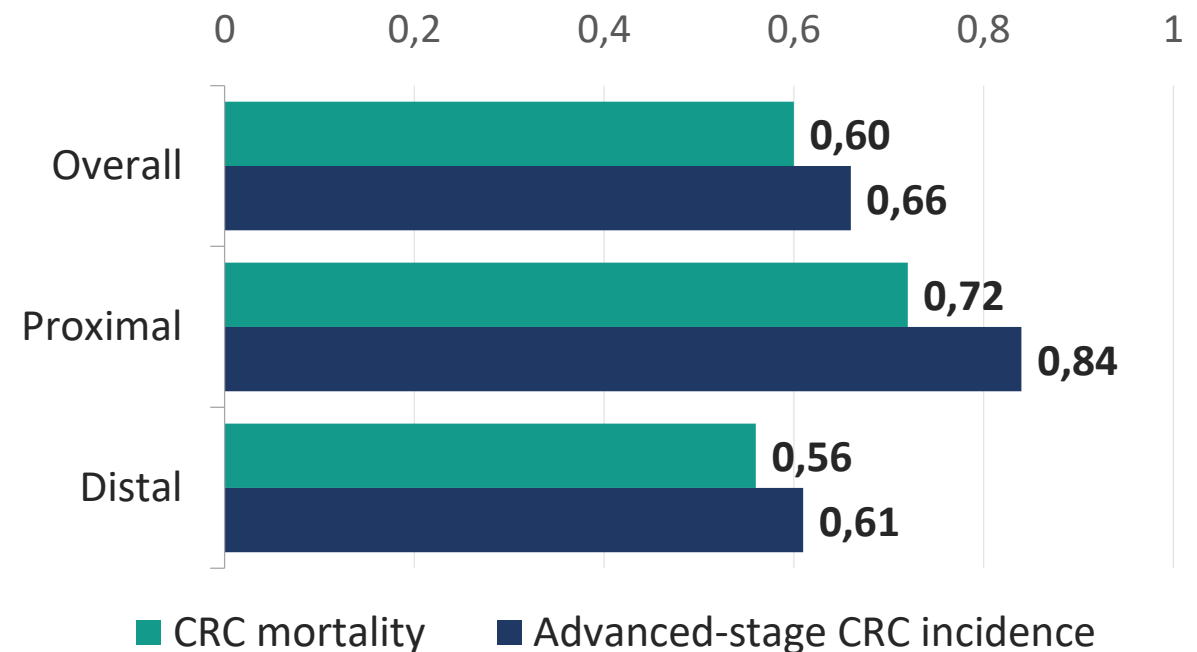
25% → 9%

stage IV, unscreened vs screened

Long-term outcome: fewer CRC deaths and advanced stage CRCs



Adjusted RR, invited vs uninvited

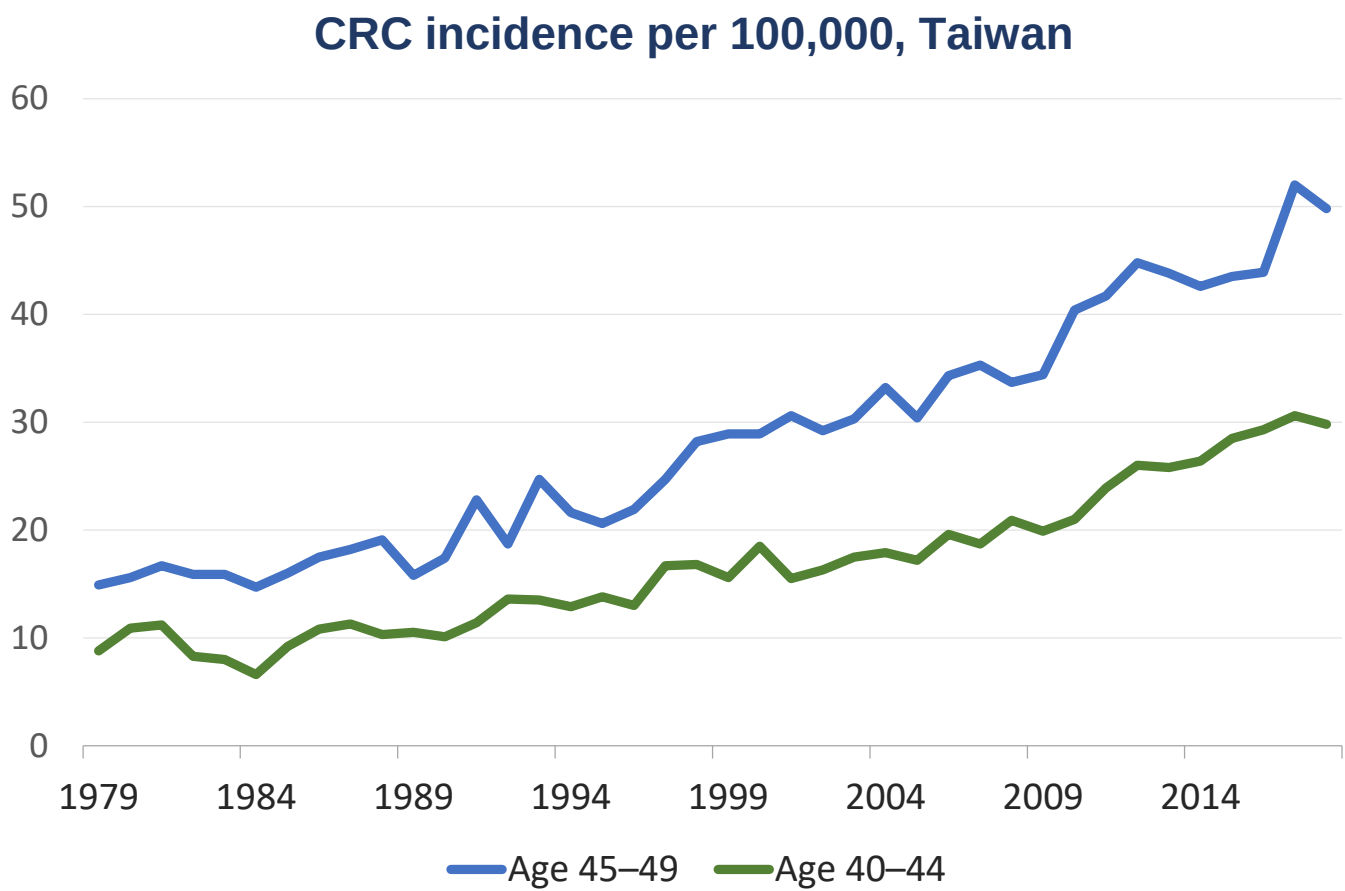


Chiu HM et al. Gut 2021;70:2321–9

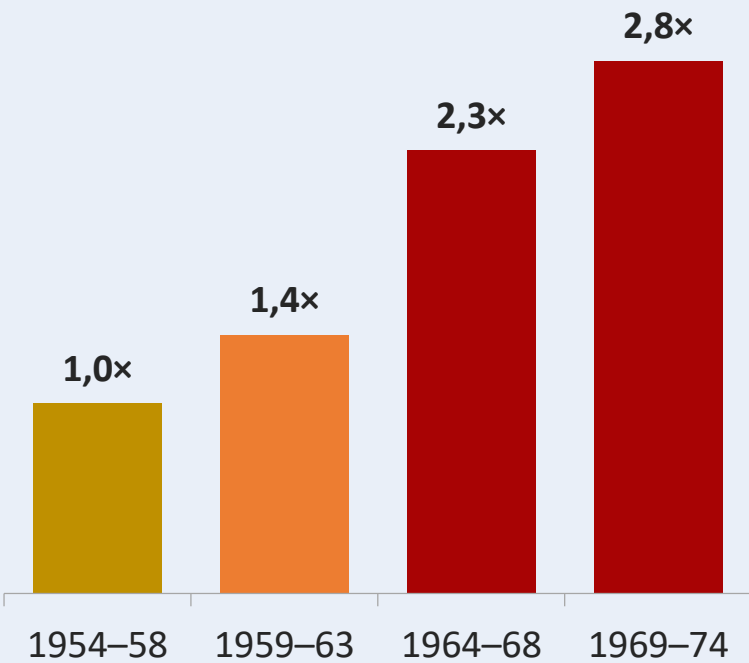
Lesson for the EU

Build data linkage and the evaluation plan in from day one: effectiveness can be shown without an RCT.

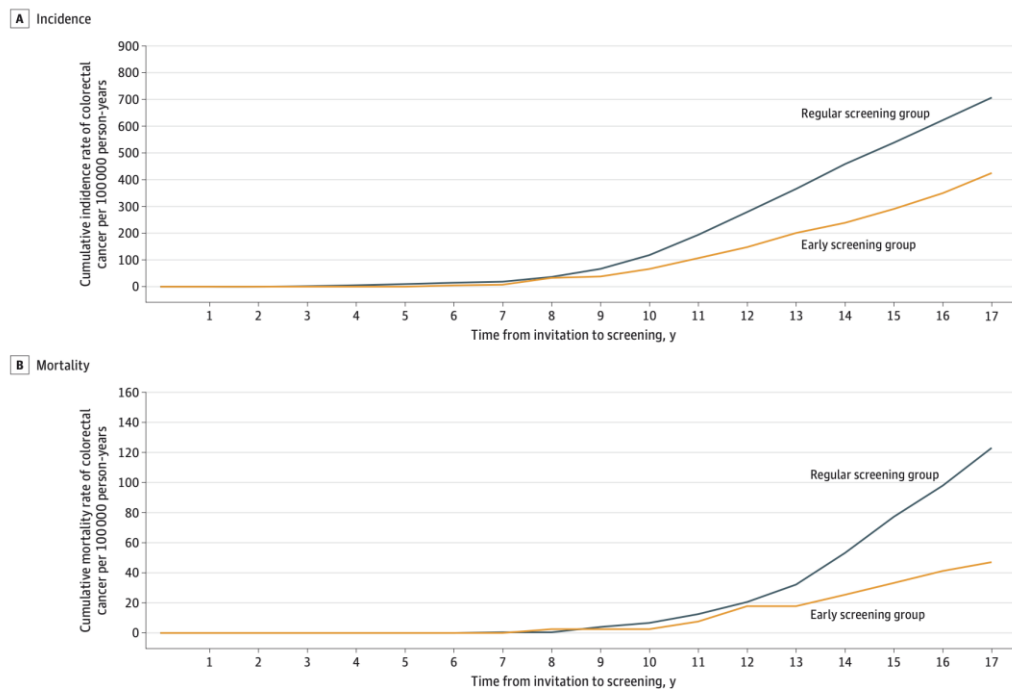
CRC under 50 is rising in Taiwan, as in Europe



Advanced adenoma risk
by birth cohort, age 45-49



Starting FIT at 40–49: evidence behind the 2025 policy



26.1 vs 42.6

CRC incidence per 100,000 PY,
early vs age-50 start

3.2 vs 7.4

CRC mortality per 100,000 PY

–21% incidence

–39% mortality

**Jan 2025: start age
lowered to 45**

Propensity score	Incidence aRR	Mortality aRR
Matching	0.79 (0.67–0.94)	0.61 (0.38–0.98)
Continuous	0.77 (0.66–0.91)	0.58 (0.38–0.91)
Decile	0.77 (0.65–0.90)	0.58 (0.37–0.89)

263,125 participants; 39,315 started at 40–49; follow-up to 2019

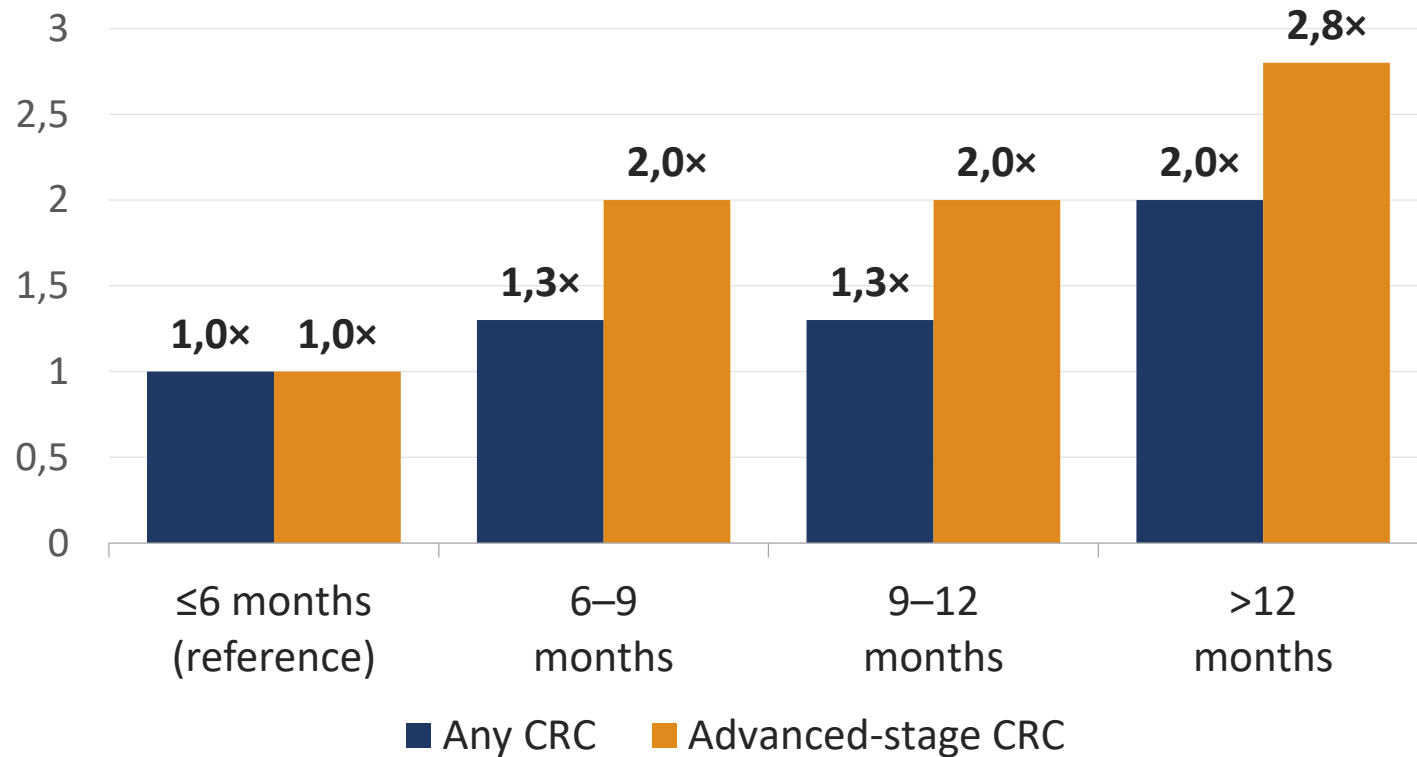
PART 2

Assure

Ensuring the quality of colonoscopy

The weak link: colonoscopy after a positive FIT

Relative risk by time from FIT+ to colonoscopy



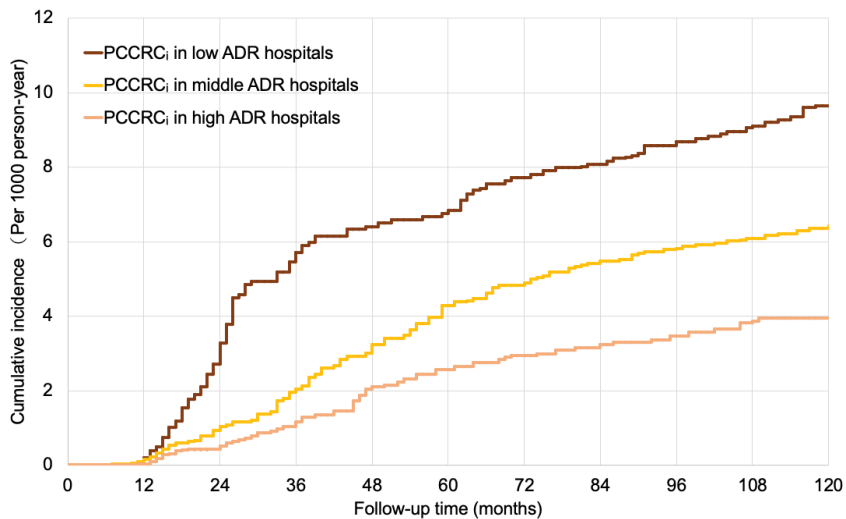
~70%

of FIT+ people completed colonoscopy, 2004–14

+64%

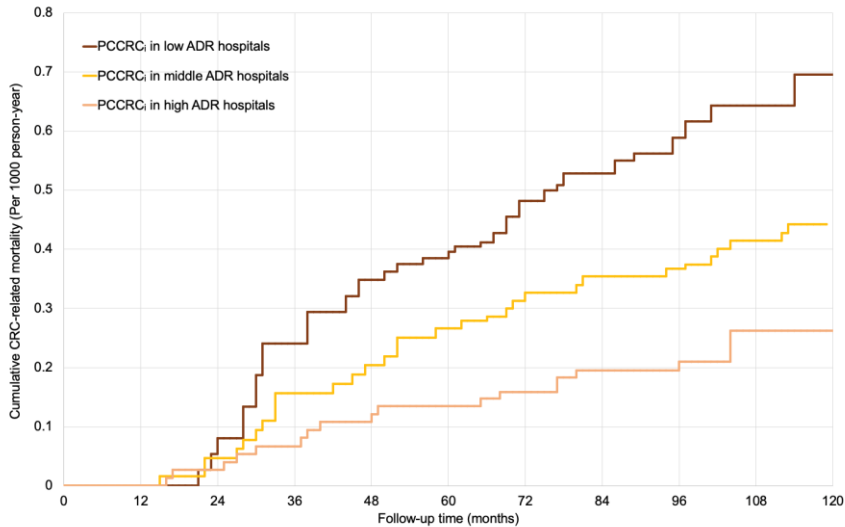
CRC death in FIT+ people who never had colonoscopy

Endoscopist performance drives program outcomes



PCCRC incidence: aHR 0.26

High ($\geq 65\%$) vs low ($< 40\%$) ADR hospitals
PCCRC 0.30 vs 1.36 per 1,000 person-years



CRC mortality: aHR 0.28

**Quality failure
is concentrated**

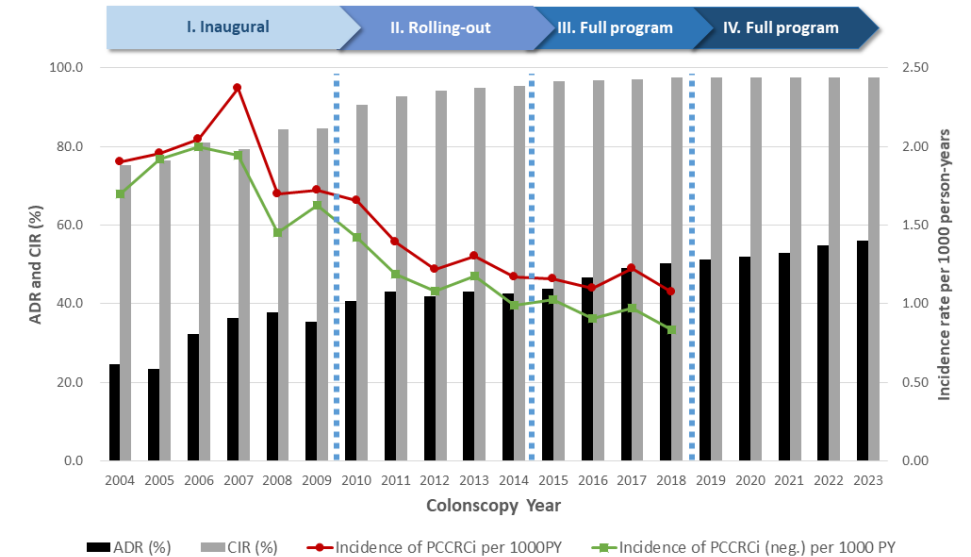
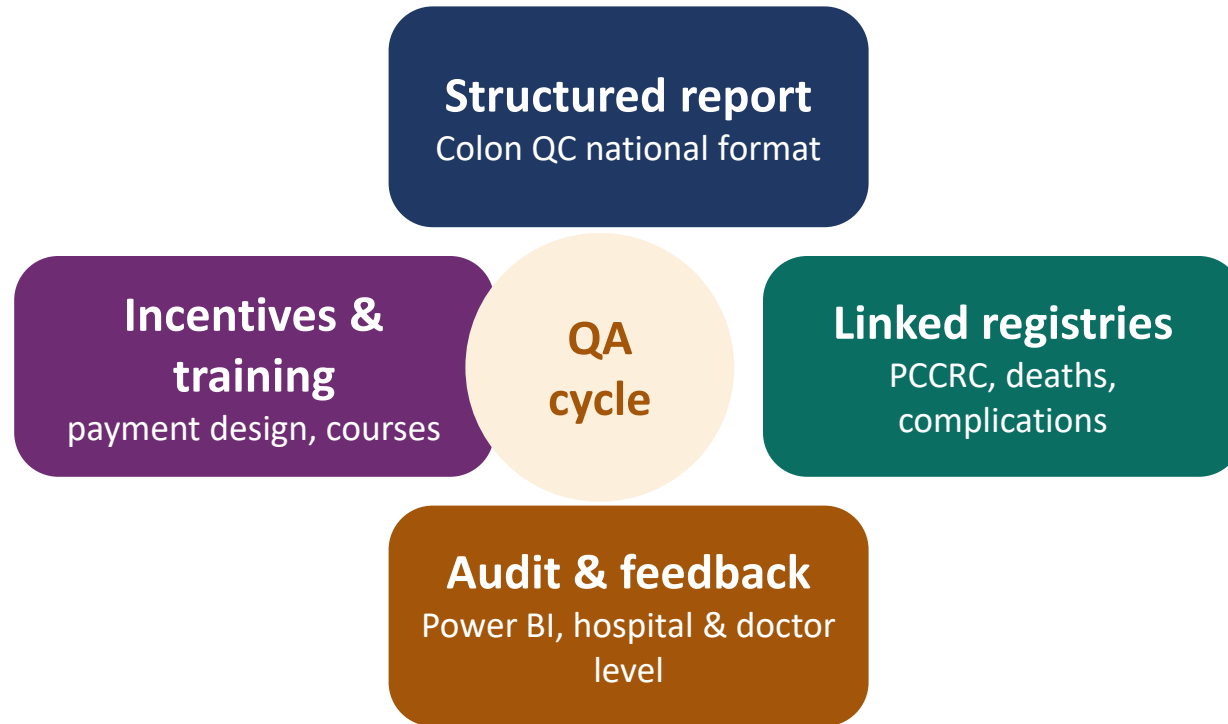
71%

of patients scoped in low-
or middle-ADR hospitals

88%

of all PCCRCs (85% of
PCCRC deaths)

Taiwan's national colonoscopy quality assurance system



24.6% → 57%

ADR, 2004 → 2023–24

-70%

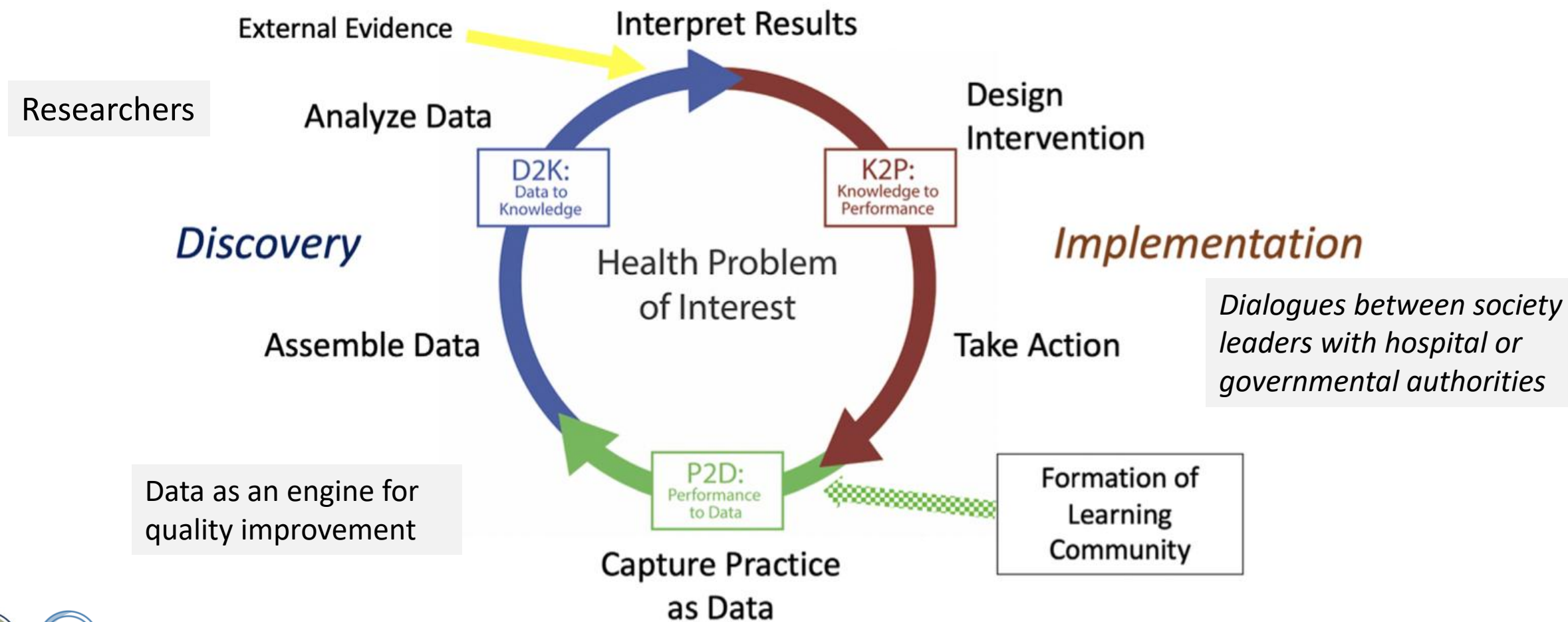
PCCRC, 3.46 → 1.04 per 1,000 PY

Chiu HM et al. DDW 2025; Hsu WF et al. JAMA Netw Open 2025

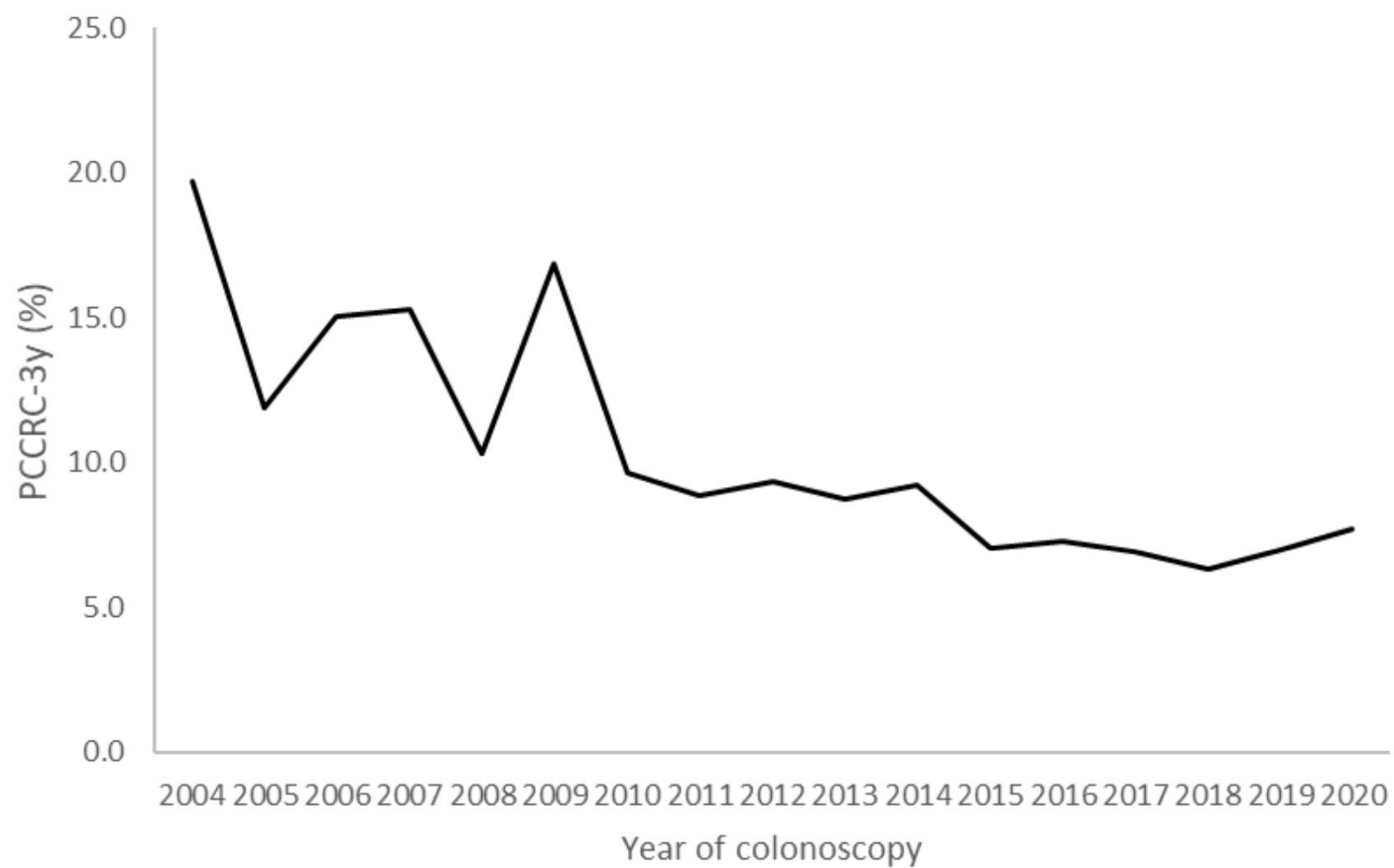
Lesson for the EU Make colonoscopy quality a program KPI, fed back to every endoscopist, and fund it.

Society as a learning community

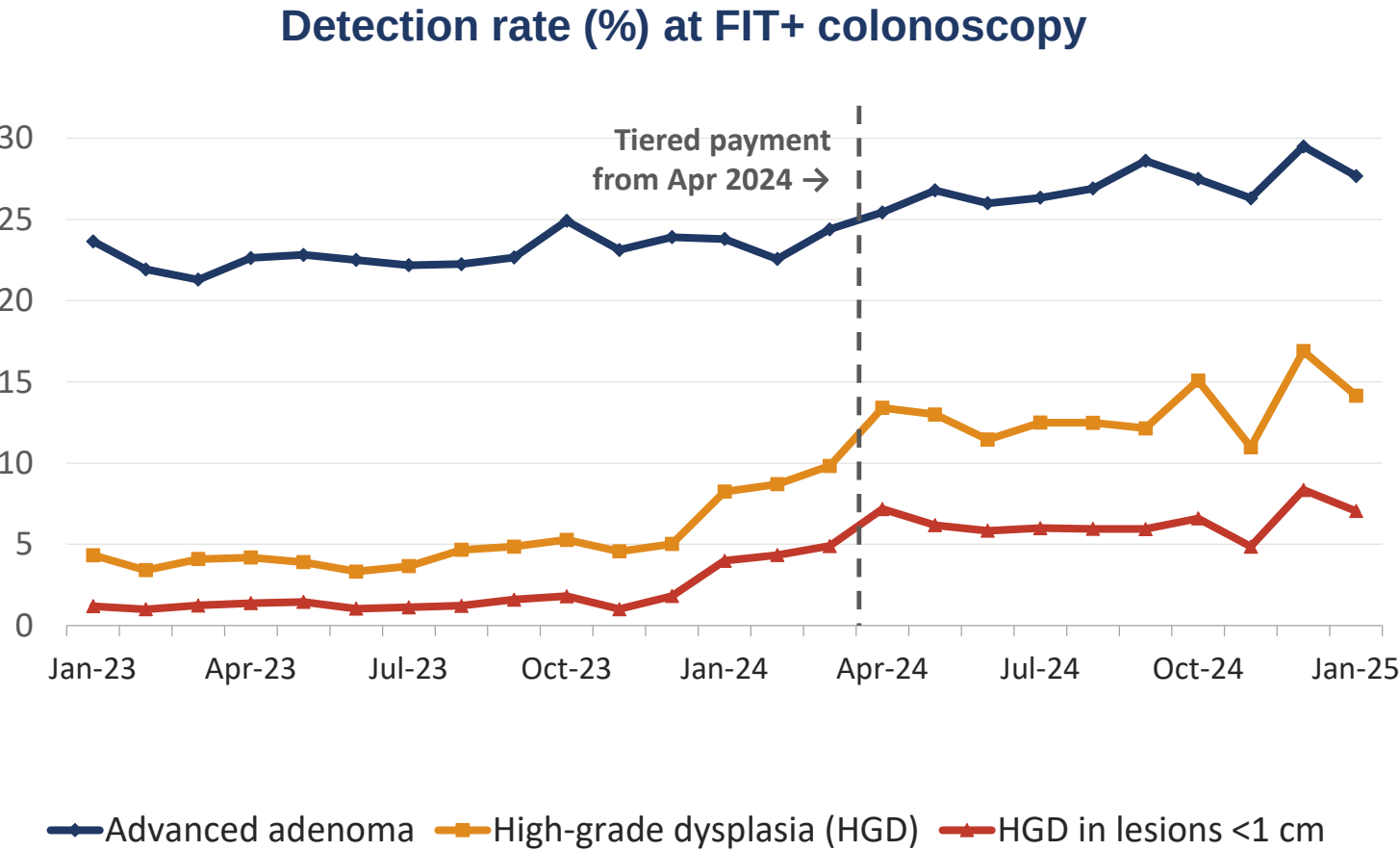
-Data is the driving force of quality improvement



Friedman et al. Learn Health Syst. 2022;6(3):e10328.



Payment design changes endoscopist behaviour



Polyps removed	Before	From Apr 2024
1–3	USD 84	USD 84
4–9	USD 84	USD 110
≥10	USD 84	USD 210

FIT+ colonoscopy supplement: USD 27 plus 57

5.2% → 13.2%

HGD detection, before vs after

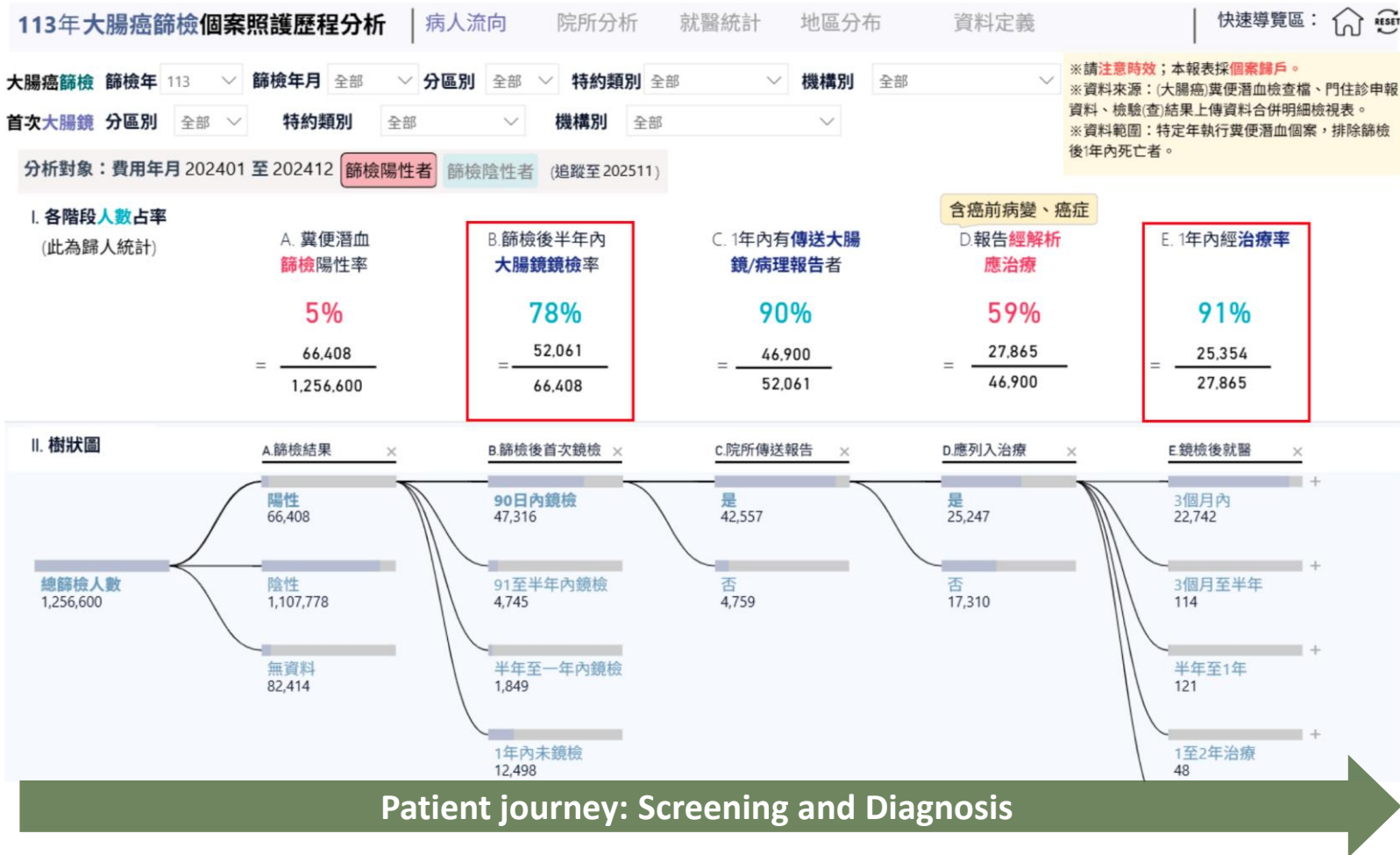
23.0% → 27.1%

advanced adenoma detection

Means: Jan 2023–Mar 2024 vs Apr 2024–Jan 2025. Chiu HM et al. DDW 2025; Taiwan CRC screening database

Digital governance of CRC screening

-Application of Power BI in colonoscopy QA



Courtesy: National Health Insurance Administration



Digital governance of CRC screening

Now we can analyze at institutional and individual doctor levels



PART 3

Personalise

Using f-Hb for precision CRC screening

FIT is quantitative: risk rises with f-Hb

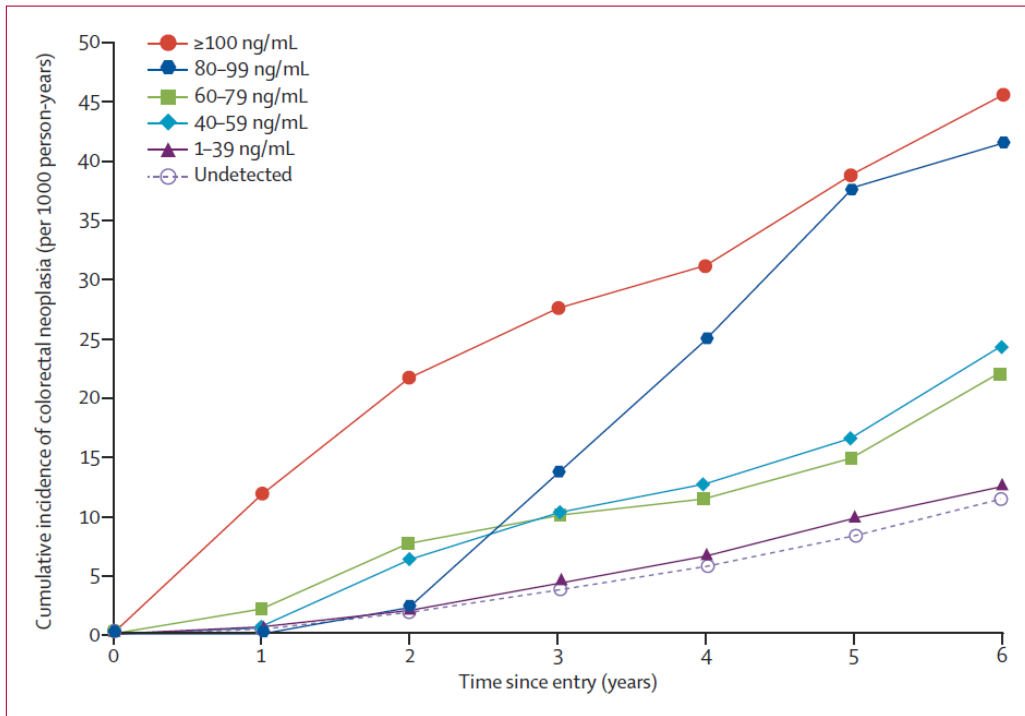
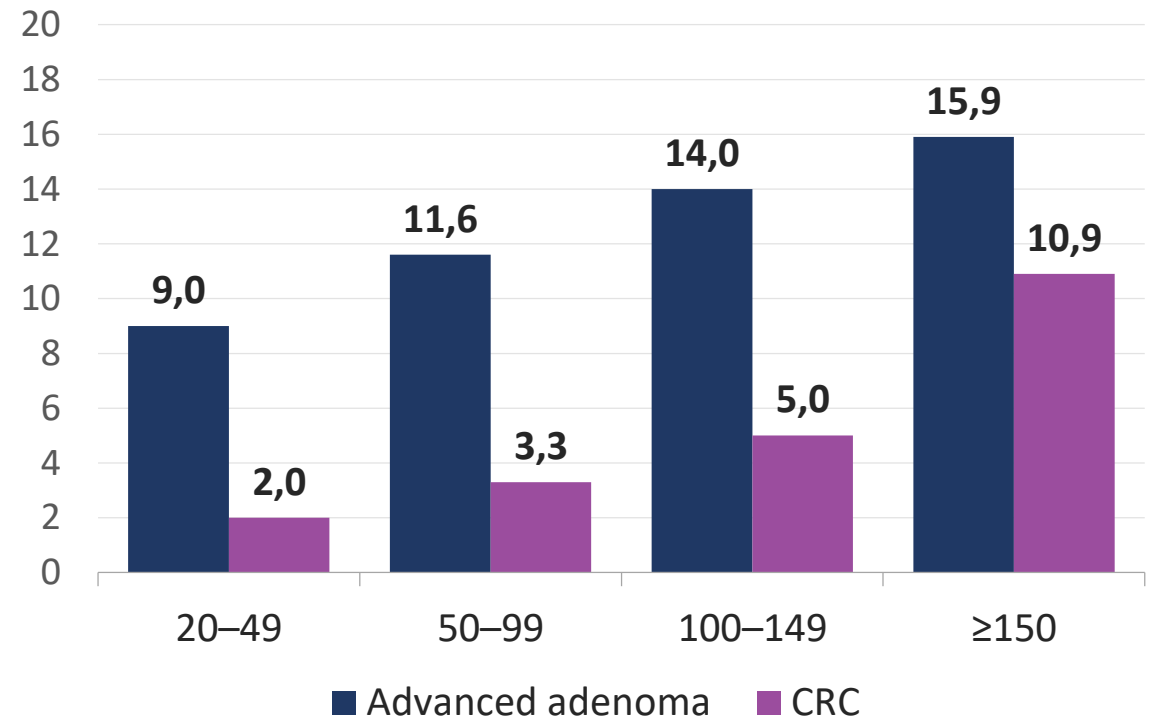


Figure 2: Cumulative incidence of adenoma and colorectal cancer, by faecal Hb concentration
Hb=haemoglobin.

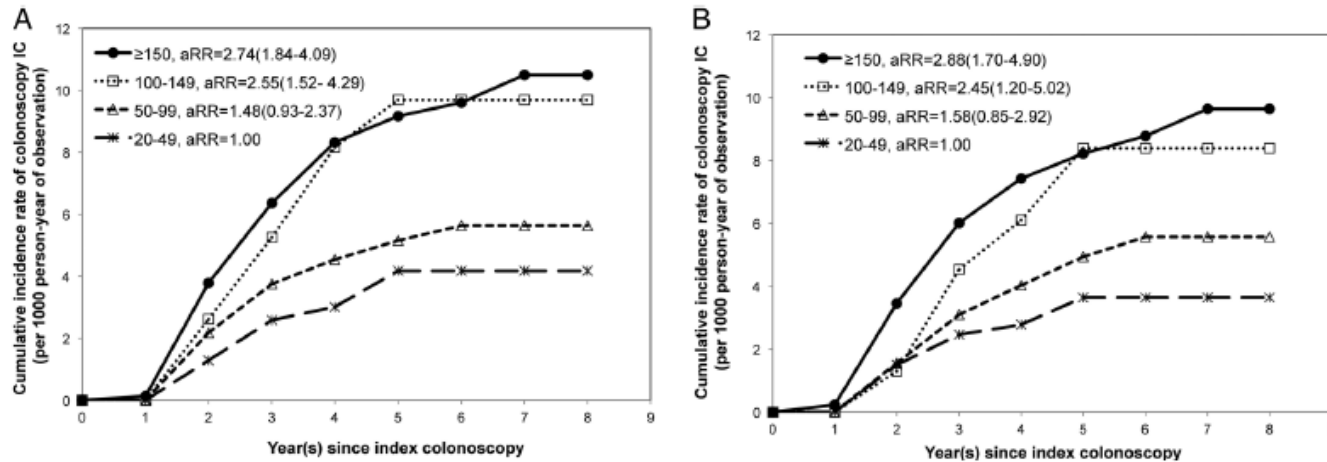
Below and around the cut-off: incident neoplasia

PPV (%) by f-Hb, µg Hb/g



Above the cut-off: positive predictive value

f-Hb predicts risk beyond the colonoscopy



Cumulative PCCRC by baseline f-Hb: overall (A) and after negative colonoscopy (B)

aRR 2.7

PCCRC with f-Hb ≥ 150 vs 20–49; 2.9 after a negative colonoscopy

4.3× / 6.7×

CRC / advanced CRC risk with f-Hb ≥ 100 vs 20–49 after FIT+

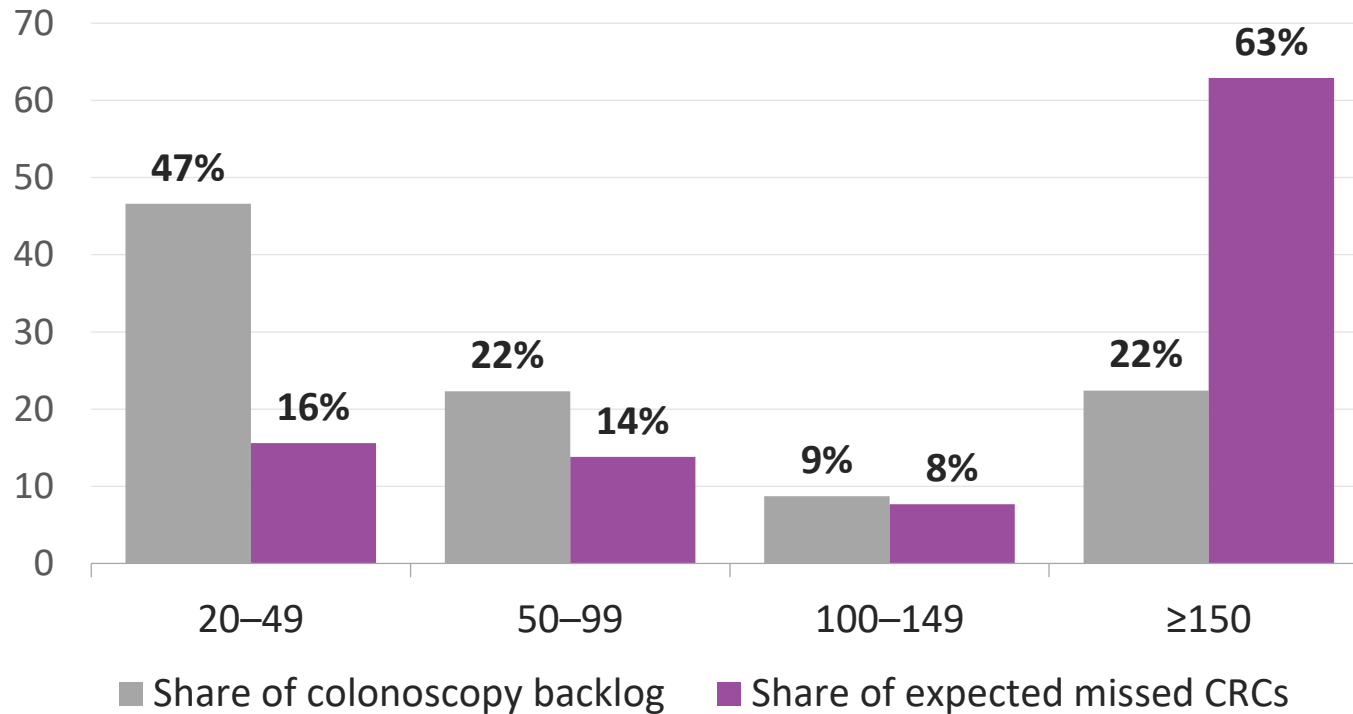
CVD & all-cause

higher f-Hb linked to cardiovascular and all-cause death

f-Hb is a risk marker, not just a test result: it can set priority, surveillance and interval

Application 1: prioritise colonoscopy by f-Hb

FIT+ backlog during COVID-19, by f-Hb ($\mu\text{g Hb/g}$)



22% → 63%

of the backlog held 63% of the expected missed CRCs

79% → 90%

colonoscopy completion, f-Hb ≥ 150 at NTUH (2018 → 2021)

Unscoped FIT+: CRC death aRR 1.31 → 2.53 as f-Hb rises

Application 2: tailor screening and surveillance intervals

f-Hb-guided screening interval (pragmatic)

f-Hb (µg Hb/g)	Relative risk	Interval
Undetectable	0.33	6 years
1–9	0.47	4 years
10–19	0.53	3 years
20–49	1.00	2 years
50–99	1.67	1 year
100–149	1.68	1 year
≥150	4.68	6 months

Yen MF et al. JAMA Oncol 2024;10:765–72

–49%

FIT tests

f-Hb-guided intervals vs
universal biennial

–46%

colonoscopies

same model, 60% referral rate

–8.2%

PCCRC risk

f-Hb + ESGE surveillance
intervals

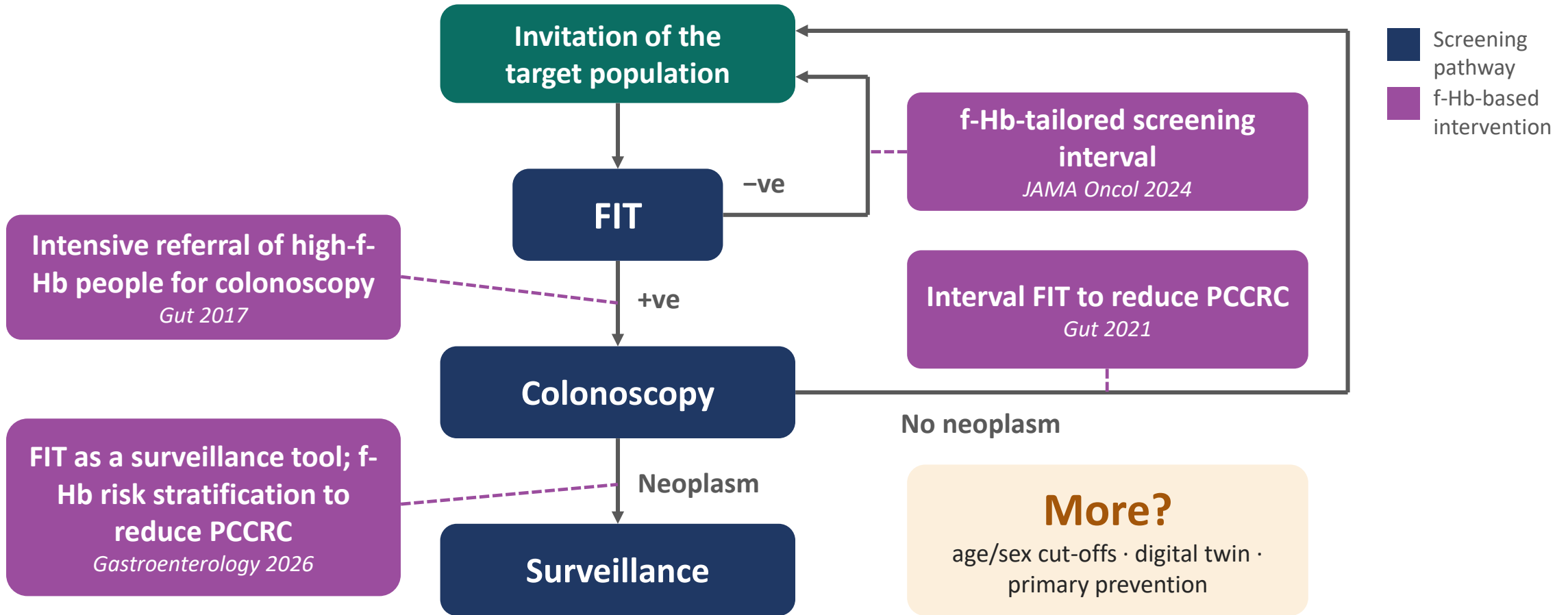
–53%

incident CRC

interval FIT after negative
colonoscopy

Yen JAMA Oncol 2024; Chuang MP et al. Gastroenterology 2026;171:354–65; Peng Gut 2021

Colorectal Cancer Screening 2.0: f-Hb at every step



Future strategies for the European Union

- 1 Link the data** Individual-level linkage is what allowed us to show aRR 0.60 for CRC death
- 2 Measure the whole pathway** One KPI set from invitation to colonoscopy within 6 months
- 3 Assure colonoscopy quality** Structured reports, endoscopist-level feedback, ADR benchmarks for FIT+
- 4 Keep the number** Report f-Hb in $\mu\text{g Hb/g}$ and store it: Scotland and the Netherlands show it travels
- 5 Personalize step by step** Prioritise high f-Hb, pilot f-Hb intervals, revisit the starting age

Take-home message



PROVE

Organised FIT screening:
CRC death aRR 0.60 at 10
years



ASSURE

Higher ADR means fewer
PCCRCs and CRC deaths



PERSONALIZE

f-Hb turns one test into a
risk-stratified program

Thank you