

Bariatric access and long-term health in Denmark: an identification boundary and registered outcome plan

Bolero

Abstract

Registered research design and conditional interpretation policy; no outcomes observed.

Keywords: Pre-registration, research design

Bariatric access and long-term health in Denmark: an identification boundary and registered outcome plan

Pre-registration: no experimental outcomes have been observed.

USER-FROZEN DRAFT — NOT INDEPENDENT SCIENTIFIC ACCEPTANCE. The user requested packaging of the current draft without further scientific iterations. Buildability and a sealed World do not establish feasibility, causal identification or successful review. See the freeze record below.

Research question

Did the Danish 2010–2011 tightening of publicly funded bariatric access alter long-term acute illness relative to clinically prioritized patients, with distinct metabolic, psychiatric, mortality and surgical-safety consequences?

Scope

One attempted clinical-group policy-ITT question under a documented identification boundary. Prospective numerical modules describe a fixed pre-2007 historically hospital-coded clinical population, ages 25-59 at the reform, under actual policies through 2024; they do not replace the central causal target.

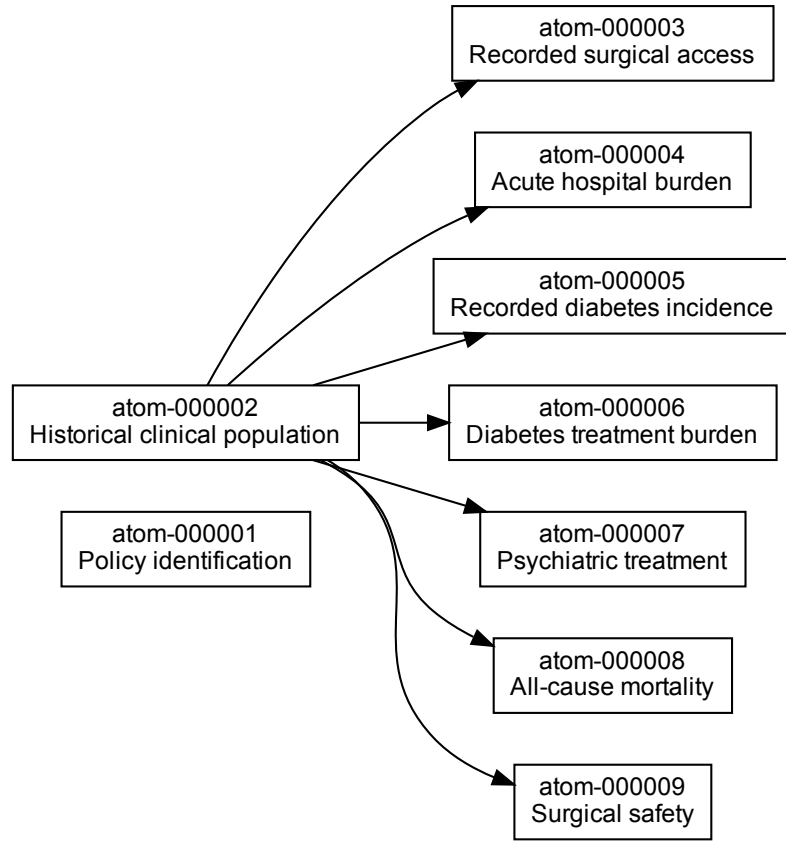


Fig. 1 Registered Atom dependencies

Graph overview

Dependency edges summarize the graph, not unconditional activation. Exact logical conditions and all local outcomes follow below; the separate graph atlas shows each Atom's branches.

Registered storyline

The policy allocation question comes first. Atom-000001 audits assignment and the missing clinical/counterfactual evidence. Atom-000002 independently determines whether a historical pre-exposure risk population can be measured. Recorded surgery

access follows before health in the paper, with whole-H and diabetes-stratum scope explicit. Acute hospital burden is the main intended health question; diabetes incidence, prevalent-disease treatment, psychiatric care and mortality each retain independent scientific interpretation. Surgical safety retains the population and operation clocks, independent complication/reintervention failures and attribution limits. All Atoms are members from birth. The paper may report a causal design boundary and measurable supplementary descriptions, but cannot claim the requested causal question was successfully answered. Interpretation is not an extra synthesis experiment.

Literature, theory and search audit

Search scope and limits

Searches were performed on 5 September 2026 using local harvested/confirmed corpora, the provenance-linked concept graph, live web, OpenAlex and PMC. Queries and timestamps are in `evidence/local-search.json`, `live-api-ledger.json`, `abstracts-and-citations.json`, `fulltext-access.json`, and `search-and-screening.yaml`. Local matches were screened as meta-data/abstracts, never treated as independent full text. The concept neighborhood yielded no directly relevant bariatric edge; the study DAG is authored from institutional/theoretical reasoning, not claimed as an extracted validated DAG.

Include Danish/Scandinavian bariatric allocation, surgery access, health, safety and economic studies; include methodological and institutional counterevidence. Exclude unrelated obesity treatments, non-Nordic technical procedures and generic cost models as direct reform evidence, while retaining relevant methodological leads. Deduplicate DOI, then PMCID/PMID, then normalized title/year. OpenAlex returned HTTP 429 with exhausted daily budget and no works. That is an access failure, not evidence of no prior art. PMC ESearch/ESummary succeeded for three complementary searches; exact query translations, counts and returned identifiers are saved. All returned titles were screened; broad unretrieved tails were not. Accessible Europe PMC XML verified selected consequential passages. Full-text access labels apply to actually retrieved papers; no supplements are claimed read unless stated.

Forward title screening of Borisenko's citation neighborhood and targeted policy/eligibility searches did not establish a duplicate Danish policy-assigned long-term-health study or a repair of the denominator. This is bounded search stability, not exhaustive systematic-review saturation. Unindexed working papers/theses, inaccessible supplements, search tails and a failed OpenAlex index remain gaps. A prior paper with the same policy exposure, pretreatment denominator and long-term estimand would defeat the proposed narrow novelty. Novelty remains conditional because the proposed effect is currently unidentified.

Binding nearest work

Study and checked source	Evidence used / access	Consequence for this study
Borisenko et al. (2015), Clinical Indications, Utilization, and Funding of Bariatric Surgery in Europe	Full text, PMC4498278; commissioning and utilization methods	Danish restrictions and aggregate surgery changes are already studied. Few annual observations limited autoregression; its aggregate change cannot supply our clinical-group first stage.
Bøgelund et al. (2022), The Effect of Bariatric Surgery on Healthcare Costs and Labor Market Attachment	Full text, PMC8933378; Danish DiD and comparison selection	Danish bariatric DiD and healthcare/labor outcomes are not new. Controls selected for surgery six years later differ from a fixed pre-policy clinical risk set. Its method does not justify eventual-recipient conditioning here.
Larsen et al. (2018), The Socio-economic Impact of Bariatric Surgery	Inherited primary abstract evidence; not independently retrieved full text on this revision	Medication, hospital costs and economic outcomes are prior art, not new endpoints by themselves. No claim about its exact identification beyond the accessible material.
Sjöholm et al. (2013), Evaluation of Current Eligibility Criteria for Bariatric Surgery	Full text, PMC3631844; SOS eligibility strata, measurements and diabetes prevention	BMI prioritization and prevention across eligibility groups are established questions. Clinical measurements and an older Swedish comparison cannot validate Danish historical-code eligibility. Nondetected interaction is not effect equivalence.
Carlsson et al. (2012), Bariatric Surgery and Prevention of Type 2 Diabetes in Swedish Obese Subjects	Inherited primary abstract evidence	Prevention is a plausible mechanism and binding prior art, not a known result in this cohort.

Study and checked source	Evidence used / access	Consequence for this study
Madsen et al. (2019), Effect of Roux-en-Y gastric bypass surgery on diabetes remission and complications in individuals with type 2 diabetes	Primary abstract retrieved through Europe PMC	Danish remission/relapse and vascular outcomes already studied. Its remission definition uses HbA1c as well as medication; dispensing reduction alone cannot reproduce it.
Memarian et al. (2019), Socioeconomic factors, body mass index and bariatric surgery	Full text, PMC6399907; access gradients and historical BMI limitations	Birth-register BMI and socioeconomic access are direct prior art. Few gradients above BMI 40 and greater female access at low/middle resources challenge a universal affluent-access account; BMI can change between measurement and surgery.
Associations Between Body Mass Index and Development of Metabolic Disorders in Fertile Women (2014)	Full text, PMC4187494; Danish birth-register methods	Antenatal BMI/metabolic follow-up is already studied. The pregnancy measurement does not measure BMI on an unrelated later reform date.
Kovacs et al. (2017), Risk of psychiatric disorders, self-harm behaviour and service use associated with bariatric surgery	Primary abstract retrieved	Psychiatric treatment and self-harm are prior art. Nondetected suicide elevation is not equivalence; service use does not uniquely measure underlying illness.
Dreber et al. (2018)	Primary abstract retrieved; Swedish recipient age comparison	Young-adult safety and follow-up differences constrain optimistic age-margin claims; they are not evidence of the Danish restriction's effect.

Study and checked source	Evidence used / access	Consequence for this study
Gerber et al. (2024), Incidence of Cancer and Cardiovascular Disease After Bariatric Surgery in Older Patients	Full text, PMC11322843; matched older Nordic cohorts	Severe cardiovascular benefit cannot be presumed; procedure and age differences prevent transferring power or effect sizes to this target.
Gribsholt et al. (2017), Overall and cause-specific mortality after Roux-en-Y gastric bypass surgery	Inherited primary abstract evidence	Danish mortality and gastrointestinal/external harms are prior art; general-population comparisons do not establish a policy ITT.
Mortality and Causes of Death After Metabolic Bariatric Surgery in Older Patients (2026)	Full text, PMC13038464; country-specific follow-up and matching	Recent Nordic mortality work includes Denmark, but its Danish follow-up is not identical to the longest Swedish follow-up. Long registry follow-up alone is not novelty or evidence of our delivered coverage.
Hansen, Gudex and Støvring (2014), Improvement in health-related quality of life following Roux-en-Y gastric bypass	Primary abstract and publisher discovery; source PDF checked where accessible	Old/new Danish eligibility classifications have already been compared among selected surgical patients. This differs from policy assignment but rules out broad first-reform-health claims.

Additional inherited counterevidence remains relevant without claiming fresh full-text verification: Jamaly et al. (2024), doi:10.1016/j.orcp.2023.12.001, uses Swedish obesity-diagnosis controls and changing follow-up associations; Neovius et al. (2018), doi:10.1016/S2213-8587(17)30437-0, examines self-harm in matched Swedish cohorts; Danish alcohol-use-disorder work, doi:10.1093/ije/dyaa147, establishes another safety pathway. None identifies this policy estimand. Source access levels must remain visible in the manuscript bibliography and any later literature update.

Theory and precise proposed contribution

Public allocation by current complications can differ from allocation by expected marginal future health benefit. Restricting early intervention may postpone prevention, whereas prioritizing established disease may concentrate immediate gains. Releasing surgical capacity for one group can benefit another. The same clinical complications that define priorities also predict untreated progression and detection, making an uncomplicated/complicated comparison especially vulnerable. Financing, assessment and treatment capacity are part of the economic mechanism; ownership alone cannot reveal payment.

Surgery could alter diabetes and cardiovascular pathways, but fewer operations also change surgical exposure to complications and revisions. Medical optimization can improve recorded treatment without surgery. Psychiatric detection, alcohol-related care and treatment-seeking can move differently from physical health. Mortality is consequential independently of admissions and is not compressed into a health index. Admission avoidance is neither a welfare total nor necessarily a clinical benefit; elective treatment, acute morbidity and recorded safety consequences must be separated.

The proposed contribution is the health consequence of policy-assigned access in a pretreatment clinical risk set, relative to a genuinely defended clinical comparator. It is not discovering the reform, bariatric DiD, metabolic benefit, psychiatric harm, a socioeconomic gradient, or Scandinavian long-term follow-up. This version cannot realize that contribution with the mapped eligibility and counterfactual evidence. Descriptive plots may document what is measurable and orient later work, but cannot be advertised as fulfillment of the causal research question.

Public schema and frozen construction contract

D1. Boundary, provenance and keys

Only tables in the supplied `inputs/data-boundary.yaml` may be planned. All 531 listed FSV tables are permitted for planning; none is represented as runtime validated. Narrow retrieval and SHA256 source identities are in `evidence/schema-ledger.yaml` and `schema-retrieval.md`. The original Danish definitions outrank unofficial English labels. The FSV row counts printed in catalog pages are not study counts and are not used. Schema retrieval concerns fields and definitions only.

Core baseline: BEF.PNR, REFERENCETID, FOED_DAG, KOEN, KOM, REG; VNDS.PNR, HAEND_DATO, INDUD_KODE; LPR_ADM.PNR, RECNUM, D_INDDTO, D_UDDTO, C_INDM, C_PATTYPE, C_SGH, C_AFD; LPR_DIAG.RECNUM, C_DIAG, C_DIAGTYPE. DOD.PNR,DODDATO supplies death independently of hospital ascertainment. BEF documents 1985–2026, VNDS 1973–2024, DOD 1970–2025, LPR_ADM/DIAG 1977–2019. Latest-extract field labels such as DOD 2025 and VNDS 2024 do not certify historical content. Runtime must verify explicit delivered date coverage, not infer it from the filename.

Operation sources: LPR_SKSOPR.RECNUM,C_OPR,D_ODTO (1996–2019); PRIV_ADM and PRIV_SKSOPR counterparts (2002–2019). Financing candidates are PRIV_FRITVALG.RECNUM,C_FRITVALG, and later

LPR_A_BETALINGSOPLYSNINGER.DW_EK_KONTAKT,DW_EK_PROCEDUREREGISTRERING,BETALER,BET_AFTALE,BE
 Provider ownership is not payer identity. A delivered private table does not resolve known incomplete self-funded/insured reporting. The registered quantitative access target is captured named procedures, never total national surgery or self-payment substitution.

Medication: LMDB.PNR12,EKSD,ATC,KORR,SEKTOR,VNR (1995–2025). EKSD is the recorded dispensing/processing date, not prescription issuance or ingestion. PNR12 requires a provider-authorized pseudonym equivalence to PNR; never truncate or decode personal identifiers. KORR and SEKTOR require official code-label mappings for finalized positive person-specific community-pharmacy dispensings. If those mappings are absent, medication components are **data_gap**; do not invent label values. No DDD, prescribed dose, days supplied or biochemical control is derived from a purchase.

Psychiatry: PSYK_ADM and PSYK_DIAG use the LPR2 names above. Their register coverage is 1995–2019 while field rows describe a 2019 extract; validate historical delivery. No cause-specific death is inferred from DOD. Suicide mortality is not an endpoint in this field contract; all-cause death and hospital-recorded self-harm remain distinct.

LPR3: LPR_A_KONTAKT.PNR,DW_EK_KONTAKT,DW_EK_FORLOEB,DW_SK_SYGEHUSOPHOLD,KONT_STARTTIDSP
 LPR_A_DIAGNOSE.DW_EK_KONTAKT,DIAG_KODE,DIAG_KODE_TYPE,DIAG_KODE_TYPE_TEKST,SENERE_AFKRAEFT
 LPR_A_FORLOEB.PNR,DW_EK_FORLOEB; LPR_A_PROCREGISTRERING.DW_EK_KONTAKT,DW_EK_FORLOEB,DW_EK_F
 Stays use LPR_A_SGHOPHOLD.DW_SK_SYGEHUSOPHOLD,PNR,SGH_OPH_STARTTIDSPUNKT,SGH_OPH_SLUTTIDSPUN
 These document mainly 2019–2025, with contact history/update references to 2017. They do not furnish pre-2011 BMI.

Every loaded table is restricted to the registered time/field projection. Require one immutable snapshot/vintage, unique BEF person/reference rows, unique LPR2 RECNUM within source, one person per LPR3 contact/pathway, and a bijective documented linkage for person-key classes. Exact duplicate rows may be removed with counts logged; contradictory duplicates are not arbitrarily chosen. Diagnose an affected component **data_gap** on reproducible unresolved contradiction; interrupted extraction is **no_result**. Do not revise upstream states after completing them: a downstream contradiction invalidates that downstream component and triggers a disclosed restriction.

Use semi-joins to select people, then join diagnoses/procedures many-to-one to their contact. Never join two unreduced child tables together. LPR3 procedures with a contact use its person; procedures without a contact use FORLOEB many-to-one. If both keys exist they must agree. Do not broadcast one pathway procedure across all its contacts. A procedure registration identifier is not assumed universally unique; use the documented source natural key and deduplicate same-person/date/code for the registered surgery-day estimand. Candidate financing rows are reduced by procedure/contact and relevant payment date; conflicting or missing payer remains unknown. A documentation/model-version disagreement blocks the mapping; the older LPR3_F guide is not proof of one-to-one equivalence to the newer FSV model.

D2. Fixed historical clinical cohort

H contains persons resident and alive on 1 January 2007, aged 25–59 on 1 January 2011, with a main or secondary DE660D diagnosis on a hospital contact beginning 1 January 2005–31 December 2006. Enforce code validity at diagnosis/contact date. This defines a historically coded extreme-obesity population; it neither imposes BMI ≤ 50 nor demonstrates BMI > 40 or suitability in 2011. Choose 2005–2006 to give both age extremes adult ascertainment opportunity, not to optimize sample size. All members are at least 19 in that window. Selection through hospital contact can still create severity/care-seeking bias.

Require positive evidence of continuous Danish residence from 1 January 2003 through 1 January 2007: BEF residence anchors and all VNDS immigration/emigration events must reconcile. An undocumented migration-code mapping, conflicting anchors, unknown DOB or unresolvable person key prevents H construction. Exclude people with known interruptions or missing individual baseline essentials; report counts and exact reasons. A globally missing essential source is a cohort `data_gap`, not a zero cohort. No operation, birth, referral or survival after 2007 is required. Prior surgery is not an exclusion from H; record it where operation capture permits, and never call first post-entry surgery first-ever surgery.

Freeze R=1 if any main/secondary 2003–2006 diagnosis lies in DE11, D0241, DI10–DI15, DG473, DE282, DM16 or DM17; R=0 otherwise, only with complete hospital delivery in that interval. Prefix matching means exact prefix plus descendants valid on the event date. R identifies recorded conditions resembling the rule’s clinical domains, without claiming refractory disease, specialty assessment or clinical clearance. Do not call R=0 uncomplicated or R=1 retained eligibility. Everyone in H has R defined from the same hospital source; an invalid subtype code flags a component, not silent reassignment. Freeze age, sex, municipality and region at baseline. No optional income, medication or disease stratum is required for H or whole-H mortality/admissions.

Baseline diabetes definitions are shared but evaluated within each using Atom so a medication failure cannot block unrelated questions. T is H with DE11* or D0241* during 1996–2006 and no DE10*/D0240*; contradictory type-1/type-2 history is U (uncertain), not forced into T. F is H with verified continuous residence and complete hospital and LMDB history 1996–2006, no DE10*–DE14*, no D024*, and no A10 dispensing. These are recorded disease-free people, not laboratory-screened people. All remaining persons are U. DO244 is gestational; DO240 and DO241 denote pre-existing type 1 and type 2; DO242/DO243/DO245/DO249 and exact unspecific DO24 prevent F classification. Historical DO245 is not backcast before April 2012. T’s hospital component can proceed without LMDB; F cannot be certified without its negative medication history. T and F access subsets are computed by the identical rules inside Atom-000003, without depending on future health results. F excludes PCOS-related metformin by design, and its external validity is correspondingly narrow.

D3. Time, vital events and outcome units

Dates are Danish local calendar dates. Follow H from 2007-01-01 through 2024-12-31, ending individual event observation on the earliest death or first emigration.

With date-only ties: count a valid hospital/procedure event dated on a death day before death; death precedes emigration on the same day; exclude healthcare events on an emigration day unless a time-stamped in-country event demonstrably precedes departure. Timestamp resolution must not vary by group. Treat competing non-type-2 diabetes as preceding type-2 diabetes on an unresolved same-day tie. No post-emigration reentry is analyzed. Admin-truncated data block the affected planned window, without removing that person from original N.

Require complete delivered calendars for each usable window, validated vital histories through its end, correct person linkage and code validity. Individual out-of-order events, events after death and conflicting resident/death records are logged; any unresolved contradiction prevents affected person-window contributions and renders that component incomplete, rather than complete-case deleting people. Conflicting death dates cannot be resolved using hospital death as an unregistered substitute. A partial component has status rows for every missing window. No interpolation over 2019 or missing years.

LPR2 acute inpatient episode: C_PATTYPE=0 (inpatient) and C_INDM=1 (acute), conditional on official Danish label verification in the delivered vintage. Exclude outpatient/ED-only contacts from acute admission counts; 2014 emergency coding changes must not silently widen this definition. Sort inpatient contacts per person, merge overlapping or contiguous next-day inpatient spells, and count an episode once at the first acute qualifying admission. Preserve elective-only spells separately for index-stay safety. Sensitivity uses overlap/same-day merging only; both outputs remain visible. LPR3 inpatient/acute semantic equivalents require authoritative label mapping of KONT_PATIENT_TYPE, PRIORITET and stay fields. Do not infer inpatient status from duration alone. Person/stay keys must agree. Apply the same next-day merge to extracted inpatient spells. If semantic continuity fails, display separate eras and mark cross-era contrast **data_gap**; an apparently smooth series cannot validate the map.

Diabetes and psychiatric new-record dates use earliest contact start for a qualifying diagnosis, not a retrospectively selected treatment date. For ongoing outpatient pathways without visit dates, count **contact starts**, not visits or treatment sessions. Do not interpret a diagnosis assigned during a long contact as exact biological onset. Restrict LPR2 disease codes to verified main/secondary diagnosis types A/B, excluding referral-only and tentative codes; use verified LPR3 equivalents and reject later-refuted diagnoses. A/B label mappings and refutation semantics must be verified in the delivered coding vintage or the component is unavailable.

Operation codes for the stable captured series are exact KJDF00, KJDF01, KJDF10, KJDF11, KJDF20, KJDF21, KJDF96, KJDF97. They represent named recorded restrictive/bypass/banding/other restrictive operations, not complete all-procedure bariatric capture. Sleeve codes KJDF40, KJDF41 are separate from 2013, endoscopic sleeve KJDF42 from 2018; balloon KJDF32 is excluded. Reversal KJDF50, KJDF51 is a separate safety component from August 2020. No unspecified gastrectomy is retrospectively labeled sleeve. Same-person/date duplicate operations across sources count as one surgery day, retaining all code labels; count distinct dates, and flag ambiguous same-day multiple procedures. Pre-introduction sleeve/reversal

components are unavailable, not zero. All include both captured public and captured private records; missing private capture changes the label to public-recorded scope and cannot establish total substitution.

SKS version rows and original fixed-width parsing provenance are in `study-sks.csv` and `classification-provenance.yaml`. Use event-date-valid exact/prefix definitions specified by each Atom, not every code in that candidate extract. ATC selections A10, A10A, A10B, N05A, N05B, N05C, N06A use licensed official date-valid meanings, recording the delivered ATC revision; do not mirror the WHO classification. Lack of historical ATC mappings blocks the affected medication component, not hospital burden.

D4. Numeric interfaces and missingness

All runtime paths below are inside a future governed results root, not pre-created study outputs in this World. Each Atom writes `results/atom-NNNNN/status.json` with `local_state` or operational `terminal`, timestamp, registered version, exact reason, component coverage and evidence references. `not_activated` is scheduler status, never `done`. Unknown evidence stays unknown. All empirical output files contain meta-data for mode and origin. Disclosure-suppressed rows have no numbers and preserve a reason.

`annual.csv` and `periods.csv` columns are `metric,period,group,stratum,clock,denominator_type,numeric`. Unique key is `metric/period/group/stratum/clock/denominator_type`. Group is R0, R1 or ALL (ALL only where explicitly registered); stratum is H,F,T or U. Clock is calendar or since_entry. Status is available, interval_unavailable, data_gap, not_identified, not_activated, no_result, or suppressed. Available rows require finite estimate and ordered finite limits and nonmissing exact units. Interval_unavailable may retain an estimate but has blank limits; no direction claim. All other nonavailable rows have blank numeric cells. Reasons are never blank on nonavailable rows.

`contrasts.csv`: `metric,period,comparison,stratum,estimate,lower,upper,unit,mode,status,reason`. Comparison is `R0_minus_R1_change` for recurrent-rate long-minus-pre contrasts, `R0_minus_R1_cumulative` for 2024 first-event fractions, or the specifically registered safety contrast. Mode is `descriptive`; no row may say causal. A row is required for every registered primary metric even if unavailable. `causal-targets.csv` uses this schema with mode `causal_target_unidentified`, blank numerical fields and status `not_identified`; it preserves the intended clinical target and its exact reason. If audit execution fails, use `no_result` while preserving the existing source-based prohibition on causal estimation.

`components.csv` adds `component>window_start>window_end>anchor>denominator_type>denominator_n,component` to the period schema for surgical safety; `window_start/window_end` are integer days since operation, `anchor` is `first_postentry_operation` or `most_recent_prior_operation`. Pre-introduction code periods stay unavailable. Separate flags/fields record diagnosis position, overlap, outcome-date precision and definition sensitivity. Exact numerators, N and person-years are only exported after disclosure review. Figure code uses these already-computed rows, never constructs estimates or denominators from raw data.

D5. Checks and truthful failure interpretation

For each component run, in order: (1) permission/delivery/vintage and date coverage; (2) keys and joins; (3) code and temporal semantics; (4) population and window reconstruction; (5) missing/contradictory events and competing-event ordering; (6) episode/dispensing/procedure deduplication; (7) aggregate denominators and reconciliation; (8) bootstrap uncertainty; (9) scope and disclosure labeling. A reproducible missing construct is an evidenced boundary. Read failures/timeouts, noncompletion and computation crashes are operational no_result. Unknown mappings are unresolved or data_gap only when the absence is evidenced, never statistical insignificance. Document planned versus delivered years and every unrun branch.

Synthetic implementation checks use invented identifiers and boundary dates only: duplicate child joins cannot inflate counts; an emigration-day event is excluded; death-day event precedes death; adjacent transfers merge; an elective index-stay complication is retained; DO241-only history cannot enter F; unknown DO24 cannot enter F; medication absence cannot block whole-H mortality; code introduction cannot create historical zeros; missing optional sleeve data cannot erase stable-operation results. No confidential rows, empirical summaries or simulated empirical plots are used at author stage.

D6. Exact displayed metric vocabulary

The following mappings freeze interfaces already defined scientifically above. All annual rows use period strings 2007 through 2024. stable_operations: operations_per_1000_original_person_years, clock calendar, denominator original_H (or original_F/original_T for registered stratum tables). acute_all/acute_cv/acute_hf/t2_inpatient/self_harm/alcohol_admissions: episodes_per_1000_original_person_years, calendar; a10_months and drug-class month metrics: dispensing_months_per_1000_original_person_years, calendar; psych_starts: contact_starts_per_1000_original_person_years, calendar. t2_cumulative and first_recorded_operation_cumulative: events_per_1000_original_persons, since_entry; death_cumulative: deaths_per_1000_original_persons, since_entry. Denominator label always matches original_H/F/T for the registered population. Safety window_first_event: events_per_1000_operations, operation, first_postentry_operation_cohort; the exact eight component/window rows and conditional numerator are frozen in atom-000009. No figure or runtime program may infer another metric mapping.

Bariatric allocation and subsequent health

I1. Question, scope and binding identification boundary

The question is whether Denmark's 2010–2011 tightening of publicly funded bariatric access changed subsequent acute hospital burden, relative to patients with clinical indications that remained prioritized. Diabetes prevention, treatment of existing diabetes, psychiatric care, cardiovascular illness, mortality and surgical safety supply distinct clinical interpretations of that allocation question. The intended estimand is

a **differential policy intention-to-treat effect**, not the effect of receiving surgery. All-cause acute admissions are the primary intended health endpoint.

This is a pre-data, unaccepted registration with an evidenced identification boundary. The mapped allowed fields do not reconstruct the intended policy-time clinical groups, and no defensible long-term untreated clinical-group trajectory has been established. There is no executable causal estimator or positive causal activation state in this version. Atom-000001 adjudicates that boundary from public evidence; it does not delegate its repair to favorable register results. The remaining Atoms preserve prospectively specified supplementary descriptions and endpoint feasibility. They are not a successful substitute for the requested causal study. Technical completion or transcription must not be called scientific acceptance of the causal question.

For the intended contrast let U denote otherwise suitable adults aged 25–59 at reform, with BMI strictly above 40 and at most 50, without a qualifying condition; let C denote otherwise suitable adults in the same BMI band with a verified qualifying condition. Let P denote introduction of the complete 2011 eligibility/assessment/organization package, with the actual later national policy sequence; let 0 denote its absence, with a specified common later policy sequence. The desired contrast at horizon h is

$$\{E[Y_h(P) - Y_h(0) | U]\} - \{E[Y_h(P) - Y_h(0) | C]\}.$$

Neither group is an untreated population. Released capacity could improve access for C . This relative effect cannot separately recover the absolute effect for U or C . A DiD would additionally require that the difference in their no- P outcome changes equal the reference-period difference, with stable ascertainment, composition, observation and an explicit treatment of anticipation and spillovers. These restrictions are not supplied by diagnosis adjustment, municipality effects, three pre-years or the name of an estimator. The later no- P path is not identified by merely naming the 2017 replacement. Consequently the expression is a target that this evidence contract cannot estimate, not a registered result awaiting only computation.

12. Institutional chronology and source hierarchy

The primary Government/Danske Regioner circular dated 17 December 2010 specifies referral at age 25 or older, BMI >35 with specified disease, and exceptional individual consideration above BMI 50 without comorbidity; BMI >50 alone is insufficient. It has no hard upper age cutoff. Conditions include type-2 diabetes, specialist-assessed difficult hypertension, documented sleep apnea, specialist-assessed PCOS and lower-limb arthrosis after assessment of exhausted treatment options. Suitability includes unsuccessful conservative care, adherence capacity and contraindication assessment. Its three-month medical pathway and preoperative weight loss were not wholly new. [Primary circular, pp. 3–7.](#)

The contemporary audit dates implementation to 1 January 2011 and documents previous BMI >40 or >35 with disease criteria, the lower-age change from 20 to 18 in 2008, the 7 November 2008–30 June 2009 suspension of extended free hospital choice, and specialty reorganization effective in January 2011. Private self-payment remained possible under older criteria. These are institutional facts, not this study’s first stage. [Rigsrevisionen, 17 October 2011, pp. 4–8.](#)

The Hovedstaden June 2012 agenda corroborates January implementation and a procurement response. A Midtjylland first-quarter 2011 report states that patients put forward after 1 January followed the new rules. It does not establish treatment of every already-referred patient. Neither record establishes exogenous regional adoption. [Hovedstaden, item 9](#); [Midtjylland report, p. 24](#).

The May 2017 visitation guideline replaces the rule from 1 July 2017. Its retrospective description of the predecessor’s validity as beginning in July 2011 conflicts with contemporary January evidence. January has the stronger contemporary support; whether July denotes a baseline convention, transition or error remains unresolved. The 2017 document removes fixed age limits and revises psychiatric wording. Initial restriction therefore is not permanent denial. [SST, May 2017, pp. 4–7](#).

The first public announcement of the final thresholds remains unknown; a June 2010 expectation of review is not that announcement. Grandfathering and complete clinical implementation in each of the five regions remain incompletely documented. `docs/evidence/institutional-ledger.yaml` retains an explicit row for every region and unresolved item. Similar surgery trajectories cannot fill these documentary gaps.

I3. Why the proposed causal repairs do not work

Historical `DE660D` denotes a BMI 40+ category during its validity, not strict reform-time BMI >40, an upper bound of 50, or complete suitability. Maternal BMI measures pregnancy-associated historical weight; using a later pregnancy to update it would condition on post-policy selection. `LPR_A_RESULTATER`, `MFR_MOR_RESULTATER` and `SILCP.PH110` do not document an appropriate pre-2011 population-wide eligibility measurement. Lab values, referral assessments and clinical bariatric-register rows are not added. The absence of a recorded contraindication is not an affirmative clinical clearance.

An age-25 difference-in-discontinuities would ask a different local question. An infinitesimal age contrast may imply an infinitesimal waiting difference as people age into access. A finite age-band comparison needs a separate no-policy age/cohort-trend argument and cannot inherit a sharp-cutoff proof. The documented 2008 age change and age-related clinical ascertainment further complicate earlier cohorts. No age bandwidth is searched, and no earlier cohort followed through 2011 is treated as unexposed.

A fuzzy DiD/Wald ratio additionally needs a precisely defined treatment timing/version, relevance in each target stratum, monotonicity and exclusion, with suitable parallel trends for treatment and potential outcomes. The medical assessment and optimization pathways can affect diabetes and psychiatric care without surgery. Changing procedures, later catch-up and a treated comparator make a single surgery-complier estimand especially demanding. No IV estimate is authorized here, even if recorded operations later differ greatly.

No staggered adoption is established. Procurement dates are not clinical adoption dates. If genuinely new evidence establishes staggered timing, a separately reviewed registration must define group-time effects and valid never-treated/not-yet-treated comparisons, using modern methods such as Callaway and Sant’Anna; already-treated

regions are not automatically controls. This is a deviation requirement, not an executable hidden branch. [Authors' methodological paper](#).

I4. Supplementary estimands and event time

Atom-000002 defines a historically coded clinical population H before anticipation; it is explicitly not U or C. Recorded-indication group R=1 and no-recorded-indication group R=0 describe hospital history, not retained/excluded eligibility. H is fixed at 1 January 2007, with age 25–59 at 1 January 2011 determined solely by birth date. No later surgery, referral, birth, residence or survival is an inclusion criterion. Follow-up begins in 2007, so pre-period trajectories are not selected using future diagnoses. Intervening surgery and disease remain part of the history.

All supplementary statistics concern **recorded events before death or first emigration**, per original baseline population, in the actual policy environment. Emigration is a terminal part of this domestic-record target, not assumed independent censoring. Counts after death/emigration contribute structurally zero recorded domestic events, not evidence of absent disease. Missing data-delivery years are never zeros. This narrower target avoids an unsupported inverse-censoring model and must be named in every output. Reentry does not resume observation.

Periods are fixed: pre 2007–2009; anticipation/transition 2010; early policy year 2011; medium 2012–2015; long 2016–2024. Annual panels show every year 2007–2024. Recurrent outcomes divide accumulated counts by original N and calendar duration in days/365.25. Cumulative first-event fractions at the ends of 2009, 2010, 2011, 2015 and 2024 use original N and competing death/emigration; they are not late-period incident flows. Full follow-up from 2007 is required for a cumulative point. A missing intervening year blocks that cumulative point but not a separately measurable later recurrent-event period.

For a recurrent endpoint j define $m(j,r,w)=1000 \sum_i N_{ij}(w)/(N_r L_w)$. Report group-specific levels and the fixed descriptive contrast $D_j=[m(j,0, \text{long})-m(j,1, \text{long})]-[m(j,0, \text{pre})-m(j,1, \text{pre})]$. This difference in changes is **associational**, not a policy ITT. Rate denominators are original-person calendar years, not survivor person-time. Event-time gaps in 2007–2009, 2010 and each later year are displayed without testing them into causal validity. Cumulative diabetes and death have no baseline-zero pretrend test; their primary descriptive endpoint is the 2024 cumulative group difference, not a prevention or survival treatment effect.

I5. Uncertainty, mixed evidence and selection

There are no confirmatory statistical causal tests in this version. All numeric analyses are registered supplementary descriptions. Every prespecified metric, period, group and unavailable position remains in the output grid. Pointwise 95% descriptive intervals use a baseline-municipality cluster bootstrap (9,999 draws, seed 20260905, resampling the observed M municipalities M times with replacement, carrying complete person histories, recomputing group denominators and all contrasts). Use empirical quantiles with linear interpolation at .025/.975. No propensity or censoring nuisance models are fitted. This model-based uncertainty treats municipalities

as exchangeable repeat-cohort units conditional on the actual national shocks; it does not quantify uncertainty in one national policy’s causal effect. Publish M and group-specific M. With fewer than 30 contributing municipalities in a required group, or more than 1% undefined bootstrap replicates, retain valid points with `interval_unavailable` and suppress directional verdicts. Do not repair by changing clusters or drawing more replicates. Thirty is a conservative reporting guard, not a power claim.

No p-values, significance-selected endpoints, FDR discoveries, or equivalence claims are made. There is no defensible common SESOI for the heterogeneous descriptive contrasts. Directional component keys are **higher** if $L > 0$, **lower** if $U < 0$, and **unresolved** otherwise, including equality, missing intervals and nonfinite limits. These compare $R=0$ with $R=1$ (or their fixed change contrast), not benefits with harms. A bounded-small or statistical-null state is deliberately absent. All interpretations are conditional on coverage and measurement. Discordant components are retained separately; no weighted health score is constructed.

Result-based selections do not authorize later hypothesis tests. Clinical strata, endpoints, code sensitivities, horizons, and comparisons are frozen here; no favorable first stage or endpoint is used to select them. Internal measurement branches change only the stated measurable scope and never promote a causal claim. Missingness, death/emigration fractions, code-version gaps, duplicates and disclosure limits are reported with every affected output. No sample size, variance, access difference, event frequency, effect direction or power has been observed.

Governance and complete reporting

This is an original study proposal in adaptive closed-graph mode. The author has read the normalized topic prompt directly on this revision. Only public documentation and published research have been accessed. No confidential register rows or computed study outcome summaries have been read. All study results are pending. The identification boundary is supported by source/schema evidence; no register first stage, nonparallel trend or statistical null has been observed.

The World root contains exactly atoms/, molecules/, prereg/. Member Atom registrations own protocols, activation and local verdicts. The Molecule owns the complete current roster and composable interpretation. The manifest is an index. The conceptual study DAG is not an activation authority. No independent authoritative graph, standalone interpretation file, derived atlas, LaTeX, PDF or acceptance checksum is authored. The Transcriber and host may compile the registration and the reviewed manuscript only after the scientific process permits it; typesetting cannot cure the causal boundary or grant scientific acceptance. Internal revision history remains outside this World.

Execution requires governed institutional authorization, appropriate legal basis, secure linkage, provider terms and disclosure review. This document does not assert that any of those runtime permissions already exist. Table permission for planning does not establish mounted/readable status. Do not export identifiers, dates that

permit reidentification, small cells, residuals or individual predictions. Retain confidential intermediate person/contact tables inside the authorized runtime. Export only reviewed aggregate outputs, code and public-safe provenance. Disclosure thresholds are set by the data provider at runtime; suppressed cells are explicit statuses with no numerical plot marks, not zeros.

STROBE and RECORD guide population flow, selection, confounding, linkage, coding, missingness and complete reporting. CODE-EHR adds structured-record provenance and reproducibility; RECORD-PE applies to medication components. STaRT-RWE/HARPER informs the attempted policy-treatment protocol and its explicit failure to supply identification. No target-trial emulation or randomized trial is claimed, and neither TARGET nor SPIRIT is asserted as a compliance badge. Reporting standards do not establish causal validity. Exact source provenance is in the routed medical catalog; relevant identifiers are STROBE doi:10.1371/journal.pmed.0040296, RECORD doi:10.1371/journal.pmed.1001885, CODE-EHR doi:10.1136/bmj-2021-069048, RECORD-PE doi:10.1136/bmj.k3532, STaRT-RWE doi:10.1136/bmj.m4856 and HARPER doi:10.1002/pds.5507.

Before execution record software/package versions, immutable delivery identifiers, field/code crosswalks, source hashes, the specific approved person-key linkage, analysis seeds and the frozen registration digest generated by the host. Freeze phenotype semantics before looking at endpoint counts. Meaning-preserving field aliases and deterministic encoding repairs may be recorded as engineering changes. Changing population, time zero, outcome definition, horizons, grouping, code meaning, estimator, local partitions or inference is scientific revision and requires a timestamped reviewed extension. Runtime and Transcriber cannot split/merge Atoms, resurrect obsolete nodes, reinterpret not `_activated` as a result, or manufacture a usable eligibility state.

Every activated Atom is mandatory. At runtime report realized local states and full component tables, or a `no_result` terminal with its reason. Operational failure does not satisfy done. An inactive branch is listed with its predicate trace. The residual Molecule rule reports any remainder but cannot override a more specific restriction. Within a multi-component experiment, verified components remain reportable if another fails; mixed signs and unavailable windows are preserved rather than averaged or silently suppressed. A later contradiction is recorded in the affected downstream Atom, with a restriction on its claim; it does not overwrite an earlier frozen protocol or state.

The numerical analyses are supplementary and descriptive. No register-outcome-guided specification search, sign-based publication, causal significance claim or equivalence conclusion is allowed. Confidence intervals are pointwise model-based descriptions, not policy-assignment intervals or family-wise discoveries. Literature searches may be updated for new external papers without inspecting study outcomes; log the source, query, date, access level and consequent scope change. Any new clinical evidence or counterfactual argument capable of replacing the current boundary requires new scientific review, not automatic activation.

Required execution audit files inside the governed results root are `run-environment.json`, `delivery-provenance.json`, `component-status.csv`, `disclosure-log.json`, `deviations.jsonl` and the per-Atom files registered in the protocols. Deviations

record affected item, trigger, evidence already viewed, timestamp, decision, scientific effect and inferential status. Preserve unused analytic trials in the governed deviation record; publish no unused candidate hand. Funding, author affiliations, provider assistance, conflicts and prepublication review rights are currently not supplied; their administrative disclosure must be completed before submission without assuming that none exist.

Author validation checks source structure, activation logic, complete member coverage, result-slot bindings and figure interfaces with status-only/synthetic fixtures. It does not test empirical feasibility or adjudicate independent scientific acceptance. No study estimator is executed and no empirical-looking synthetic figures are deposited in this World.

Registered interpretation rules

Restrictions take precedence over permissions; residual reporting does not invent a finding.

1. restriction

Condition: TRUE

Under every result combination this version has no identified causal estimator. Historical H/R, descriptive differences, access strength, compatibility of pre-period profiles and successful code execution cannot be presented as a policy ITT, surgery effect, causal mediation, successful causal candidate, remission, welfare index or scientific acceptance. Component scope, measurement and censoring/competing-event limits always constrain numeric narration.

```
kind: restriction
condition: 'TRUE'
says: Under every result combination this version has no identified causal
      estimator. Historical H/R, descriptive differences, access strength,
      ↪ compatibility
      of pre-period profiles and successful code execution cannot be presented
      as a policy ITT, surgery effect, causal mediation, successful causal
      ↪ candidate,
      remission, welfare index or scientific acceptance. Component scope,
      ↪ measurement
      and censoring/competing-event limits always constrain numeric narration.
```

2. restriction

Condition: `state(atom-000001) == "otherwise"` OR `terminal(atom-000001) == "no_result"`

The audit is unresolved or operationally failed. Do not equate missing resolution with validated eligibility or a negative effect. The existing registration-level prohibition on causal estimation still applies.

```
kind: restriction
condition: state(atom-000001) == "otherwise" OR terminal(atom-000001) ==
      ↪ "no_result"
```

says: The audit is unresolved or operationally failed. Do not equate missing resolution with validated eligibility or a negative effect. The existing registration-level prohibition on causal estimation still applies.

3. primary

Condition: state(atom-000001) == "not_identified"

The source/schema audit establishes an identification boundary for the intended 2011 clinical-group policy ITT. The central causal question remains unanswered; this is a candidate boundary, not a statistical null and not a successful descriptive replacement.

```
kind: primary
condition: state(atom-000001) == "not_identified"
says: The source/schema audit establishes an identification boundary for the
      intended 2011 clinical-group policy ITT. The central causal question remains
      unanswered; this is a candidate boundary, not a statistical null and not
      a successful descriptive replacement.
```

4. restriction

Condition: state(atom-000002) == "data_gap" OR state(atom-000002) == "otherwise" OR terminal(atom-000002) == "no_result"

H-dependent numerical experiments have no authorized denominator and remain not_activated. Report the exact cohort boundary or unresolved/operational state. Preserve the policy audit independently.

```
kind: restriction
condition: state(atom-000002) == "data_gap" OR state(atom-000002) ==
  ↳ "otherwise"
  OR terminal(atom-000002) == "no_result"
says: H-dependent numerical experiments have no authorized denominator and
      remain not_activated. Report the exact cohort boundary or
      ↳ unresolved/operational
      state. Preserve the policy audit independently.
```

5. supplementary

Condition: state(atom-000002) == "historical_ready"

A fixed historical clinical population can support registered domestic-record descriptions. It is not the reform-time eligible population. Retain baseline selection, prior operations, clinical coding and group-empty limitations.

```
kind: supplementary
condition: state(atom-000002) == "historical_ready"
says: A fixed historical clinical population can support registered
      ↳ domestic-record
      descriptions. It is not the reform-time eligible population. Retain baseline
      selection, prior operations, clinical coding and group-empty limitations.
```

6. restriction

Condition: `state(atom-000003) == "data_gap"`

Recorded operation access, capture and disease-stratum patterns: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```
kind: restriction
condition: state(atom-000003) == "data_gap"
says: 'Recorded operation access, capture and disease-stratum patterns: no
      complete principal endpoint is available. Describe the evidenced
      ↪ source/phenotype
      boundary without an effect estimate or null claim; independently retained
      supplementary components remain scoped.'
```

7. restriction

Condition: `state(atom-000003) == "partial"`

Recorded operation access, capture and disease-stratum patterns: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```
kind: restriction
condition: state(atom-000003) == "partial"
says: 'Recorded operation access, capture and disease-stratum patterns: only
      the named available components/windows and valid intervals may be
      ↪ interpreted.
      Publish their individual directions, exact missing reasons and uncertainty
      limits. Missing one component is not negative evidence about another.'
```

8. supplementary

Condition: `state(atom-000003) == "higher"`

Recorded operation access, capture and disease-stratum patterns: report the registered higher descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000003) == "higher"
says: 'Recorded operation access, capture and disease-stratum patterns: report
      the registered higher descriptive contrast(s), with exact time, target,
      units and pointwise intervals. This concerns recorded group patterns; it
      does not establish causal benefit or harm. All measurement/attribution
      ↪ limits
      and any opposed or unavailable registered sensitivities must accompany this
      wording.'
```

9. supplementary

Condition: state(atom-000003) == "lower"

Recorded operation access, capture and disease-stratum patterns: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000003) == "lower"
says: 'Recorded operation access, capture and disease-stratum patterns: report
the registered lower descriptive contrast(s), with exact time, target, units
and pointwise intervals. This concerns recorded group patterns; it does
not establish causal benefit or harm. All measurement/attribution limits
and any opposed or unavailable registered sensitivities must accompany this
wording.'
```

10. supplementary

Condition: state(atom-000003) == "otherwise"

Recorded operation access, capture and disease-stratum patterns: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000003) == "otherwise"
says: 'Recorded operation access, capture and disease-stratum patterns: report
estimates/components where valid and unresolved directions where intervals
touch/span zero or mapping evidence remains ambiguous. Unresolved is not
equivalence, insignificance, a weak causal first stage or no clinical
↪ importance.'
```

11. restriction

Condition: terminal(atom-000003) == "no_result"

Recorded operation access, capture and disease-stratum patterns: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000003) == "no_result"
says: 'Recorded operation access, capture and disease-stratum patterns:
↪ execution
did not yield a scientific result. Publish no_result and exact reason,
↪ without
substituting a null. Other independently measurable experiments remain
↪ governed
by their own activation and evidence.'
```

12. restriction

Condition: state(atom-000004) == “data_gap”

All-cause and cardiovascular acute hospital burden: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```
kind: restriction
condition: state(atom-000004) == "data_gap"
says: 'All-cause and cardiovascular acute hospital burden: no complete
↪ principal
    endpoint is available. Describe the evidenced source/phenotype boundary
    without an effect estimate or null claim; independently retained
    ↪ supplementary
    components remain scoped.'
```

13. restriction

Condition: state(atom-000004) == “partial”

All-cause and cardiovascular acute hospital burden: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```
kind: restriction
condition: state(atom-000004) == "partial"
says: 'All-cause and cardiovascular acute hospital burden: only the named
    available components/windows and valid intervals may be interpreted. Publish
    their individual directions, exact missing reasons and uncertainty limits.
    Missing one component is not negative evidence about another.'
```

14. supplementary

Condition: state(atom-000004) == “higher”

All-cause and cardiovascular acute hospital burden: report the registered higher descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000004) == "higher"
says: 'All-cause and cardiovascular acute hospital burden: report the
↪ registered
    higher descriptive contrast(s), with exact time, target, units and pointwise
    intervals. This concerns recorded group patterns; it does not establish
    causal benefit or harm. All measurement/attribution limits and any opposed
    or unavailable registered sensitivities must accompany this wording.'
```

15. supplementary

Condition: state(atom-000004) == “lower”

All-cause and cardiovascular acute hospital burden: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000004) == "lower"
says: 'All-cause and cardiovascular acute hospital burden: report the
↪ registered
    lower descriptive contrast(s), with exact time, target, units and pointwise
    intervals. This concerns recorded group patterns; it does not establish
    causal benefit or harm. All measurement/attribution limits and any opposed
    or unavailable registered sensitivities must accompany this wording.'
```

16. supplementary

Condition: state(atom-000004) == “discordant”

All-cause and cardiovascular acute hospital burden: principal components have opposing descriptive directions. State both with their units and intervals; no uniform benefit, harm or average score follows.

```
kind: supplementary
condition: state(atom-000004) == "discordant"
says: 'All-cause and cardiovascular acute hospital burden: principal
↪ components
    have opposing descriptive directions. State both with their units and
    ↪ intervals;
    no uniform benefit, harm or average score follows.'
```

17. supplementary

Condition: state(atom-000004) == “otherwise”

All-cause and cardiovascular acute hospital burden: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000004) == "otherwise"
says: 'All-cause and cardiovascular acute hospital burden: report
↪ estimates/components
    where valid and unresolved directions where intervals touch/span zero or
    mapping evidence remains ambiguous. Unresolved is not equivalence,
    ↪ insignificance,
    a weak causal first stage or no clinical importance.'
```

18. restriction

Condition: terminal(atom-000004) == “no_result”

All-cause and cardiovascular acute hospital burden: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000004) == "no_result"
says: 'All-cause and cardiovascular acute hospital burden: execution did not
      yield a scientific result. Publish no_result and exact reason, without
      ↪ substituting
      a null. Other independently measurable experiments remain governed by their
      own activation and evidence.'
```

19. restriction

Condition: state(atom-000005) == "data_gap"

Cumulative recorded type-2 diabetes in the baseline disease-free stratum: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```
kind: restriction
condition: state(atom-000005) == "data_gap"
says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
      ↪ stratum:
      no complete principal endpoint is available. Describe the evidenced
      ↪ source/phenotype
      boundary without an effect estimate or null claim; independently retained
      supplementary components remain scoped.'
```

20. restriction

Condition: state(atom-000005) == "partial"

Cumulative recorded type-2 diabetes in the baseline disease-free stratum: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```
kind: restriction
condition: state(atom-000005) == "partial"
says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
      ↪ stratum:
      only the named available components/windows and valid intervals may be
      ↪ interpreted.
      Publish their individual directions, exact missing reasons and uncertainty
      limits. Missing one component is not negative evidence about another.'
```

21. supplementary

Condition: state(atom-000005) == "higher"

Cumulative recorded type-2 diabetes in the baseline disease-free stratum: report the registered higher descriptive contrast(s), with exact time, target, units and point-wise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000005) == "higher"
says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
↪ stratum:
  report the registered higher descriptive contrast(s), with exact time,
  ↪ target,
  units and pointwise intervals. This concerns recorded group patterns; it
  does not establish causal benefit or harm. All measurement/attribution
  ↪ limits
  and any opposed or unavailable registered sensitivities must accompany this
  wording.'
```

22. supplementary

Condition: state(atom-000005) == "lower"

Cumulative recorded type-2 diabetes in the baseline disease-free stratum: report the registered lower descriptive contrast(s), with exact time, target, units and point-wise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000005) == "lower"
says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
↪ stratum:
  report the registered lower descriptive contrast(s), with exact time,
  ↪ target,
  units and pointwise intervals. This concerns recorded group patterns; it
  does not establish causal benefit or harm. All measurement/attribution
  ↪ limits
  and any opposed or unavailable registered sensitivities must accompany this
  wording.'
```

23. supplementary

Condition: state(atom-000005) == "otherwise"

Cumulative recorded type-2 diabetes in the baseline disease-free stratum: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000005) == "otherwise"
says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
↪ stratum:
  report estimates/components where valid and unresolved directions where
  intervals touch/span zero or mapping evidence remains ambiguous. Unresolved
```

is not equivalence, insignificance, a weak causal first stage or no clinical importance.'

24. restriction

Condition: terminal(atom-000005) == "no_result"

Cumulative recorded type-2 diabetes in the baseline disease-free stratum: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000005) == "no_result"
says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
↪ stratum:
    execution did not yield a scientific result. Publish no_result and exact
    reason, without substituting a null. Other independently measurable
    ↪ experiments
    remain governed by their own activation and evidence.'
```

25. restriction

Condition: state(atom-000006) == "data_gap"

Medication and inpatient burden in prevalent type-2 diabetes: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```
kind: restriction
condition: state(atom-000006) == "data_gap"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: no
↪ complete
    principal endpoint is available. Describe the evidenced source/phenotype
    boundary without an effect estimate or null claim; independently retained
    supplementary components remain scoped.'
```

26. restriction

Condition: state(atom-000006) == "partial"

Medication and inpatient burden in prevalent type-2 diabetes: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```
kind: restriction
condition: state(atom-000006) == "partial"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: only
    the named available components/windows and valid intervals may be
    ↪ interpreted.
    Publish their individual directions, exact missing reasons and uncertainty
    limits. Missing one component is not negative evidence about another.'
```

27. supplementary

Condition: state(atom-000006) == “higher”

Medication and inpatient burden in prevalent type-2 diabetes: report the registered higher descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000006) == "higher"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: report
      the registered higher descriptive contrast(s), with exact time, target,
      units and pointwise intervals. This concerns recorded group patterns; it
      does not establish causal benefit or harm. All measurement/attribution
      ↪ limits
      and any opposed or unavailable registered sensitivities must accompany this
      wording.'
```

28. supplementary

Condition: state(atom-000006) == “lower”

Medication and inpatient burden in prevalent type-2 diabetes: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000006) == "lower"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: report
      the registered lower descriptive contrast(s), with exact time, target, units
      and pointwise intervals. This concerns recorded group patterns; it does
      not establish causal benefit or harm. All measurement/attribution limits
      and any opposed or unavailable registered sensitivities must accompany this
      wording.'
```

29. supplementary

Condition: state(atom-000006) == “discordant”

Medication and inpatient burden in prevalent type-2 diabetes: principal components have opposing descriptive directions. State both with their units and intervals; no uniform benefit, harm or average score follows.

```
kind: supplementary
condition: state(atom-000006) == "discordant"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: principal
      components have opposing descriptive directions. State both with their units
      and intervals; no uniform benefit, harm or average score follows.'
```

30. supplementary

Condition: state(atom-000006) == “otherwise”

Medication and inpatient burden in prevalent type-2 diabetes: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000006) == "otherwise"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: report
      estimates/components where valid and unresolved directions where intervals
      touch/span zero or mapping evidence remains ambiguous. Unresolved is not
      equivalence, insignificance, a weak causal first stage or no clinical
      ↪ importance.'
```

31. restriction

Condition: terminal(atom-000006) == “no_result”

Medication and inpatient burden in prevalent type-2 diabetes: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000006) == "no_result"
says: 'Medication and inpatient burden in prevalent type-2 diabetes: execution
      did not yield a scientific result. Publish no_result and exact reason,
      ↪ without
      substituting a null. Other independently measurable experiments remain
      ↪ governed
      by their own activation and evidence.'
```

32. restriction

Condition: state(atom-000007) == “data_gap”

Psychiatric service use and related recorded harms: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```
kind: restriction
condition: state(atom-000007) == "data_gap"
says: 'Psychiatric service use and related recorded harms: no complete
      ↪ principal
      endpoint is available. Describe the evidenced source/phenotype boundary
      without an effect estimate or null claim; independently retained
      ↪ supplementary
      components remain scoped.'
```

33. restriction

Condition: state(atom-000007) == “partial”

Psychiatric service use and related recorded harms: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```
kind: restriction
condition: state(atom-000007) == "partial"
says: 'Psychiatric service use and related recorded harms: only the named
      available components/windows and valid intervals may be interpreted. Publish
      their individual directions, exact missing reasons and uncertainty limits.
      Missing one component is not negative evidence about another.'
```

34. supplementary

Condition: state(atom-000007) == “higher”

Psychiatric service use and related recorded harms: report the registered higher descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000007) == "higher"
says: 'Psychiatric service use and related recorded harms: report the
      ↪ registered
      higher descriptive contrast(s), with exact time, target, units and pointwise
      intervals. This concerns recorded group patterns; it does not establish
      causal benefit or harm. All measurement/attribution limits and any opposed
      or unavailable registered sensitivities must accompany this wording.'
```

35. supplementary

Condition: state(atom-000007) == “lower”

Psychiatric service use and related recorded harms: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000007) == "lower"
says: 'Psychiatric service use and related recorded harms: report the
      ↪ registered
      lower descriptive contrast(s), with exact time, target, units and pointwise
      intervals. This concerns recorded group patterns; it does not establish
      causal benefit or harm. All measurement/attribution limits and any opposed
      or unavailable registered sensitivities must accompany this wording.'
```

36. supplementary

Condition: state(atom-000007) == “discordant”

Psychiatric service use and related recorded harms: principal components have opposing descriptive directions. State both with their units and intervals; no uniform benefit, harm or average score follows.

```
kind: supplementary
condition: state(atom-000007) == "discordant"
says: 'Psychiatric service use and related recorded harms: principal
↪ components
    have opposing descriptive directions. State both with their units and
    ↪ intervals;
    no uniform benefit, harm or average score follows.'
```

37. supplementary

Condition: state(atom-000007) == "otherwise"

Psychiatric service use and related recorded harms: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000007) == "otherwise"
says: 'Psychiatric service use and related recorded harms: report
↪ estimates/components
    where valid and unresolved directions where intervals touch/span zero or
    mapping evidence remains ambiguous. Unresolved is not equivalence,
    ↪ insignificance,
    a weak causal first stage or no clinical importance.'
```

38. restriction

Condition: terminal(atom-000007) == "no_result"

Psychiatric service use and related recorded harms: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000007) == "no_result"
says: 'Psychiatric service use and related recorded harms: execution did not
    yield a scientific result. Publish no_result and exact reason, without
    ↪ substituting
    a null. Other independently measurable experiments remain governed by their
    own activation and evidence.'
```

39. restriction

Condition: state(atom-000008) == "data_gap"

Cumulative all-cause domestic-record mortality: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```

kind: restriction
condition: state(atom-000008) == "data_gap"
says: 'Cumulative all-cause domestic-record mortality: no complete principal
      endpoint is available. Describe the evidenced source/phenotype boundary
      without an effect estimate or null claim; independently retained
      ↪ supplementary
      components remain scoped.'
```

40. restriction

Condition: state(atom-000008) == “partial”

Cumulative all-cause domestic-record mortality: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```

kind: restriction
condition: state(atom-000008) == "partial"
says: 'Cumulative all-cause domestic-record mortality: only the named
      ↪ available
      components/windows and valid intervals may be interpreted. Publish their
      individual directions, exact missing reasons and uncertainty limits. Missing
      one component is not negative evidence about another.'
```

41. supplementary

Condition: state(atom-000008) == “higher”

Cumulative all-cause domestic-record mortality: report the registered higher descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```

kind: supplementary
condition: state(atom-000008) == "higher"
says: 'Cumulative all-cause domestic-record mortality: report the registered
      higher descriptive contrast(s), with exact time, target, units and pointwise
      intervals. This concerns recorded group patterns; it does not establish
      causal benefit or harm. All measurement/attribution limits and any opposed
      or unavailable registered sensitivities must accompany this wording.'
```

42. supplementary

Condition: state(atom-000008) == “lower”

Cumulative all-cause domestic-record mortality: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```

kind: supplementary
condition: state(atom-000008) == "lower"
```

says: 'Cumulative all-cause domestic-record mortality: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.'

43. supplementary

Condition: state(atom-000008) == "otherwise"

Cumulative all-cause domestic-record mortality: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000008) == "otherwise"
says: 'Cumulative all-cause domestic-record mortality: report
↪ estimates/components
    where valid and unresolved directions where intervals touch/span zero or
    mapping evidence remains ambiguous. Unresolved is not equivalence,
    ↪ insignificance,
    a weak causal first stage or no clinical importance.'
```

44. restriction

Condition: terminal(atom-000008) == "no_result"

Cumulative all-cause domestic-record mortality: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000008) == "no_result"
says: 'Cumulative all-cause domestic-record mortality: execution did not yield
    a scientific result. Publish no_result and exact reason, without
    ↪ substituting
    a null. Other independently measurable experiments remain governed by their
    own activation and evidence.'
```

45. restriction

Condition: state(atom-000009) == "data_gap"

Complications, reinterventions and operation-clock safety: no complete principal endpoint is available. Describe the evidenced source/phenotype boundary without an effect estimate or null claim; independently retained supplementary components remain scoped.

```
kind: restriction
condition: state(atom-000009) == "data_gap"
says: 'Complications, reinterventions and operation-clock safety: no complete
    principal endpoint is available. Describe the evidenced source/phenotype
    boundary without an effect estimate or null claim; independently retained
    supplementary components remain scoped.'
```

46. restriction

Condition: state(atom-000009) == “partial”

Complications, reinterventions and operation-clock safety: only the named available components/windows and valid intervals may be interpreted. Publish their individual directions, exact missing reasons and uncertainty limits. Missing one component is not negative evidence about another.

```
kind: restriction
condition: state(atom-000009) == "partial"
says: 'Complications, reinterventions and operation-clock safety: only the
      named available components/windows and valid intervals may be interpreted.
      Publish their individual directions, exact missing reasons and uncertainty
      limits. Missing one component is not negative evidence about another.'
```

47. supplementary

Condition: state(atom-000009) == “higher”

Complications, reinterventions and operation-clock safety: report the registered higher descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000009) == "higher"
says: 'Complications, reinterventions and operation-clock safety: report the
      registered higher descriptive contrast(s), with exact time, target, units
      and pointwise intervals. This concerns recorded group patterns; it does
      not establish causal benefit or harm. All measurement/attribution limits
      and any opposed or unavailable registered sensitivities must accompany this
      wording.'
```

48. supplementary

Condition: state(atom-000009) == “lower”

Complications, reinterventions and operation-clock safety: report the registered lower descriptive contrast(s), with exact time, target, units and pointwise intervals. This concerns recorded group patterns; it does not establish causal benefit or harm. All measurement/attribution limits and any opposed or unavailable registered sensitivities must accompany this wording.

```
kind: supplementary
condition: state(atom-000009) == "lower"
says: 'Complications, reinterventions and operation-clock safety: report the
      registered lower descriptive contrast(s), with exact time, target, units
      and pointwise intervals. This concerns recorded group patterns; it does
      not establish causal benefit or harm. All measurement/attribution limits
      and any opposed or unavailable registered sensitivities must accompany this
      wording.'
```

49. supplementary

Condition: state(atom-000009) == "discordant"

Complications, reinterventions and operation-clock safety: principal components have opposing descriptive directions. State both with their units and intervals; no uniform benefit, harm or average score follows.

```
kind: supplementary
condition: state(atom-000009) == "discordant"
says: 'Complications, reinterventions and operation-clock safety: principal
      components have opposing descriptive directions. State both with their units
      and intervals; no uniform benefit, harm or average score follows.'
```

50. supplementary

Condition: state(atom-000009) == "otherwise"

Complications, reinterventions and operation-clock safety: report estimates/components where valid and unresolved directions where intervals touch/span zero or mapping evidence remains ambiguous. Unresolved is not equivalence, insignificance, a weak causal first stage or no clinical importance.

```
kind: supplementary
condition: state(atom-000009) == "otherwise"
says: 'Complications, reinterventions and operation-clock safety: report
      ↪ estimates/components
      where valid and unresolved directions where intervals touch/span zero or
      mapping evidence remains ambiguous. Unresolved is not equivalence,
      ↪ insignificance,
      a weak causal first stage or no clinical importance.'
```

51. restriction

Condition: terminal(atom-000009) == "no_result"

Complications, reinterventions and operation-clock safety: execution did not yield a scientific result. Publish no_result and exact reason, without substituting a null. Other independently measurable experiments remain governed by their own activation and evidence.

```
kind: restriction
condition: terminal(atom-000009) == "no_result"
says: 'Complications, reinterventions and operation-clock safety: execution
      did not yield a scientific result. Publish no_result and exact reason,
      ↪ without
      substituting a null. Other independently measurable experiments remain
      ↪ governed
      by their own activation and evidence.'
```

52. residual

Condition: TRUE

Report every remaining pending, not_activated, suppressed, unresolved or operational component and its predicate/reason. Rules compose: unconditional/scoped

restrictions first, then compatible primary and supplementary claims. Partial-state restrictions permit retained component narration but never a uniform summary. No remainder is assigned a favorable interpretation.

```
kind: residual
condition: 'TRUE'
says: 'Report every remaining pending, not_activated, suppressed, unresolved
      or operational component and its predicate/reason. Rules compose:
      ↪ unconditional/scoped
      restrictions first, then compatible primary and supplementary claims.
      ↪ Partial-state
      restrictions permit retained component narration but never a uniform
      ↪ summary.
      No remainder is assigned a favorable interpretation.'
```

Preregistered epistemic graph

Each Atom is an interpretable question or diagnostic judgment. Local result states determine registered activation.

atom-000001

Can the 2011 allocation change and the intended clinical-group counterfactual support a long-term policy ITT within the allowed evidence?

Activation: TRUE

- **not_identified:** At least one indispensable intended eligibility construct or the intended long-term counterfactual is demonstrably unsupported by the frozen mapped evidence; this takes precedence over unresolved subsidiary chronology. — The proposed clinical-group causal ITT is not identified in this contract. It is not a statistical null, a failed runtime mount, or success of a descriptive replacement.
- **otherwise:** otherwise — Audit evidence is unresolved. No causal estimator or positive eligibility state is authorized; report the precise unresolved predicates.

atom-000002

Can a pretreatment historically coded severe-obesity population and its recorded clinical groups be followed without future-treatment selection?

Activation: TRUE

- **data_gap:** Verified absence of a required core field, label mapping, continuous-residence reconstruction or unresolvable core-key contradiction prevents the D2 cohort; or the verified eligible historical H count is zero. — No H-denominator analysis is available; empty H is an empirical population boundary, not no policy effect.
- **historical_ready:** The D2 core keys, coding, residence and time-zero rules are resolved, H has at least one member, and a unique frozen person table and R are constructed; this is only historical validity. — H can support scoped descriptions. Policy eligibility remains unmeasured. Empty R cells block only group contrasts, not ALL descriptions.

- **otherwise:** otherwise — Cohort evidence is unresolved; dependent empirical modules remain not `_activated` until a realized allowed state, with no missing-evidence-to-zero substitution.

atom-000003

How did captured bariatric-operation access evolve across recorded baseline clinical need, including the diabetes strata?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap:** No principal stable-operation component for any H group/window is scientifically estimable because of documented source/definition gaps. — Captured access cannot be described in this contract; no first-stage-null claim follows.
- **partial:** At least one principal H operation component is valid but another registered principal H window/group/interval or a required contrast is unavailable. — Report each retained operation result and exact missing component. Optional payer/sleeve/F/T gaps do not trigger a broad failure.
- **lower:** All principal H components and fixed long-minus-pre R0-minus-R1 contrast have valid scope/uncertainty, and its upper limit is <0 . — The recorded access gap decreased descriptively; no causal loss of access or surgery mechanism is established.
- **higher:** All principal H components and fixed contrast have valid scope/uncertainty, and its lower limit is >0 . — The recorded access gap increased descriptively; clinical policy exposure is not identified.
- **otherwise:** otherwise — Access differences are unresolved or span zero. This is neither equivalence nor a weak/strong causal first-stage judgment.

atom-000004

How do all-cause acute admissions and serious cardiovascular acute admissions evolve across recorded baseline clinical need?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap:** No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is demonstrably unavailable. — This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- **partial:** At least one principal component is scientifically estimable, but at least one other principal component, required period/group/contrast or uncertainty interval is unavailable. Evaluate before sign regions. — Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.
- **discordant:** All principal contrasts have valid intervals and scope; at least one has $\text{lower} > 0$ and at least one has $\text{upper} < 0$. — Principal components differ in descriptive direction; report them separately, with no average health score.
- **higher:** All principal contrasts have valid intervals/scope and every lower limit is >0 . — All principal registered descriptive contrasts are higher; this is not a causal harm verdict.

- **lower:** All principal contrasts have valid intervals/scope and every upper limit is <0 . — All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- **otherwise:** otherwise — Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither equivalence nor uniformity is established.

atom-000005

Among people without recorded baseline diabetes, how does cumulative recorded type-2 diabetes develop across baseline clinical-need groups?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap:** No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is demonstrably unavailable. — This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- **partial:** At least one principal component is scientifically estimable, but at least one other principal component, required period/group/contrast or uncertainty interval is unavailable. Evaluate before sign regions. — Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.
- **higher:** All principal contrasts have valid intervals/scope and every lower limit is >0 . — All principal registered descriptive contrasts are higher; this is not a causal harm verdict.
- **lower:** All principal contrasts have valid intervals/scope and every upper limit is <0 . — All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- **otherwise:** otherwise — Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither equivalence nor uniformity is established.

atom-000006

Among people with recorded pre-existing type-2 diabetes, how do medication treatment and hospital burden evolve?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap:** No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is demonstrably unavailable. — This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- **partial:** At least one principal component is scientifically estimable, but at least one other principal component, required period/group/contrast or uncertainty interval is unavailable. Evaluate before sign regions. — Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.

- **discordant:** All principal contrasts have valid intervals and scope; at least one has lower >0 and at least one has upper <0 . — Principal components differ in descriptive direction; report them separately, with no average health score.
- **higher:** All principal contrasts have valid intervals/scope and every lower limit is >0 . — All principal registered descriptive contrasts are higher; this is not a causal harm verdict.
- **lower:** All principal contrasts have valid intervals/scope and every upper limit is <0 . — All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- **otherwise:** otherwise — Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither equivalence nor uniformity is established.

atom-000007

How does specialist psychiatric treatment evolve alongside hospital-recorded self-harm, alcohol treatment and psychotropic use?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap:** No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is demonstrably unavailable. — This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- **partial:** At least one principal component is scientifically estimable, but at least one other principal component, required period/group/contrast or uncertainty interval is unavailable. Evaluate before sign regions. — Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.
- **discordant:** All principal contrasts have valid intervals and scope; at least one has lower >0 and at least one has upper <0 . — Principal components differ in descriptive direction; report them separately, with no average health score.
- **higher:** All principal contrasts have valid intervals/scope and every lower limit is >0 . — All principal registered descriptive contrasts are higher; this is not a causal harm verdict.
- **lower:** All principal contrasts have valid intervals/scope and every upper limit is <0 . — All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- **otherwise:** otherwise — Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither equivalence nor uniformity is established.

atom-000008

What is cumulative recorded all-cause mortality in the historical clinical groups over long follow-up?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap**: No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is demonstrably unavailable. — This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- **partial**: At least one principal component is scientifically estimable, but at least one other principal component, required period/group/contrast or uncertainty interval is unavailable. Evaluate before sign regions. — Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.
- **higher**: All principal contrasts have valid intervals/scope and every lower limit is >0 . — All principal registered descriptive contrasts are higher; this is not a causal harm verdict.
- **lower**: All principal contrasts have valid intervals/scope and every upper limit is <0 . — All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- **otherwise**: otherwise — Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither equivalence nor uniformity is established.

atom-000009

What recorded hospital complications and reinterventions accompany subsequent bariatric procedures, on both population and operation clocks?

Activation: `state(atom-000002) == "historical_ready"`

- **data_gap**: No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is demonstrably unavailable. — This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- **partial**: At least one principal component is scientifically estimable, but at least one other principal component, required period/group/contrast or uncertainty interval is unavailable. Evaluate before sign regions. — Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.
- **discordant**: All principal contrasts have valid intervals and scope; at least one has lower >0 and at least one has upper <0 . — Principal components differ in descriptive direction; report them separately, with no average health score.
- **higher**: All principal contrasts have valid intervals/scope and every lower limit is >0 . — All principal registered descriptive contrasts are higher; this is not a causal harm verdict.
- **lower**: All principal contrasts have valid intervals/scope and every upper limit is <0 . — All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- **otherwise**: otherwise — Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither equivalence nor uniformity is established.

User-directed freeze (not independent scientific acceptance)

- Verdict: `user_frozen`

The user explicitly requested packaging the current scientifically regrouped draft without another author/reviewer iteration. The current draft has NOT received independent technical acceptance. Native accepted status denotes the sealed user-directed handoff only. No empirical analysis has been executed, and no feasibility, causal identification, novelty or result is certified by this build. All scientific protocols, questions, result partitions, activation conditions, scope restrictions, authored paper and figure code are preserved from the frozen source. Outstanding limitations in that source remain in force. In particular, preserve the draft's eligibility/counterfactual limitations and distinguish descriptive health trajectories from an identified policy or surgery effect. Packaging is not approval of a causal DiD claim.

Checks

- `granularity: actual_scientific_unit_regrouping_present`
- `native_structure: pass`
- `paper_and_figure_interfaces: pass`
- `independent_scientific_review: not_accepted_current_revision`

Issues

limitation: Current scientific draft

No independent reviewer accepted this frozen revision.

Repair: No further scientific iteration, by explicit user instruction; limitations remain disclosed.

Independent checks

Packaging checks only: source fidelity, native World validity, PDF build, checksums and ZIP integrity; no new scientific review.

Execution supplement

Frozen reference execution

This implements all nine frozen Atoms in the original adaptive study. The World has no prereg/code/ or prereg/replication/. It forbids a causal estimator: these programs construct the historical cohort and registered descriptive outcomes. No causal DiD, IV, survival model, weighting, matching, significance test or new scientific experiment is added. Synthetic data are tests, never study evidence.

CLI and dispatch

```
/home/shaoerzhuo/anaconda3/bin/python /ACTION/execution/run.py \  
--atom atom-000004 --world /READ_ONLY_WORLD \  
--inputs /GOVERNED_ACTION/inputs.json --output /GOVERNED_RESULTS \  
--dispatch-policy activation_respecting \  
--evidence-trust /TRUSTED_SCHEDULER/accepted-results.json
```

Output is `/GOVERNED_RESULTS/atom-000004/`. Existing nonempty Atom outputs are never overwritten. Output and private-artifact directories must be outside the World and disjoint. Copy code to a writable action workspace; World paths are explicit. `-help` needs no data. The command supports every ID atom-000001 through atom-000009.

Default dispatch uses the native Strong Kleene activation evaluator. Unknown is not false; operational `no_result` does not satisfy done. Direct dispatch bypasses only outer activation. It can construct D2 locally from the same registered inputs, labeled local construction rather than accepted predecessor evidence. A supplied H predecessor marked `no_result`, `data_gap` or otherwise is not retried or overridden. Optional inputs are checked separately within each Atom. The `evidence-trust` option is required only to consume a scientific predecessor; it is unnecessary for initial Atoms or direct dispatch with no predecessor.

Input manifest

JSON is an operational interface, not a second scientific registration. Paths are explicit and relative paths resolve against the manifest. The executable synthetic example is generated by `synthetic.fixture(ABSOLUTE_SCRATCH_PATH)`. Its labels are invented fixture values, never defaults for Danish dictionaries.

Top-level key	Meaning
origin	synthetic or governed; a fixture must never be relabeled governed evidence
authorization	status=authorized plus an evidence reference supplied by the caller
documents	Document IDs mapped to path, sha256 and origin
tables	Only registered D1 projections in contracts.FIELDS; descriptors below
semantics	Source-backed dictionary entries below
person_linkage	Optional pharmacy CSV descriptor: path, sha256, evidence; PNR12/PNR columns must be bijective
private_output	Governed intermediate directory, separate from aggregate outputs
predecessors	Optional map Atom ID to path and sha256 of its execution status.json

Top-level key	Meaning
cohort_artifact	Optional path and sha256 of H.csv, bound to a historical_ready predecessor
disclosure	Exact aggregate-payload approval, described below

Every evidence reference has document=DOCUMENT_ID and locator=EXACT_SECTION. Documents must exist and match their hashes. Metadata is not runtime delivery: the loader reads supplied CSV projections and verifies their hashes. No mount, coverage, coding meaning or availability is inferred from a filename or count.

A delivered table descriptor has status=delivered, path, sha256, immutable vintage, complete_intervals (inclusive ISO start/end pairs), and evidence. Use status=data_gap with documented evidence and reason for a verified absence; unresolved for an unknown meaning/delivery; no_result for an operational failure. An omitted table is unresolved, not an evidenced zero.

CSV columns retain D1 names. Identifiers are strings, including leading zeros. Dates require a documented mechanical encoding into Danish local ISO dates or local timestamps; calculations use local calendar dates. No identifier decoding or truncation occurs. Complete intervals concern the registered construct and clock, including child records and carry-in contacts needed for spell assembly. They are not observed min/max dates. Missing intervening years block cumulative histories; independently complete later recurrent periods remain available. Vital history from entry is required to identify first exit even for later rates.

Each semantics entry contains value and evidence, or status/reason/evidence. A scientific choice is not resolved merely by providing a value. These entries represent verified dictionaries/delivery semantics; they cannot change the cohort, outcome definitions, windows, estimators, bootstrap or result regions.

Semantics entry	Required source-backed value
BEF.reference_dates	Delivered REFERENCECID values mapped to exact snapshot dates
BEF.membership_alive_resident	true only when snapshot membership proves alive/resident enrollment
VNDS.direction	Raw INDUD_KODE to immigration/emigration
LPR.patient_type and PSYK/PRIV counterparts	Raw labels to inpatient/outpatient/emergency/exclude; D3 requires 0=inpatient
LPR.admission and PSYK/PRIV counterparts	Raw labels to acute/elective/exclude; D3 requires 1=acute
LPR.diagnosis_role and PSYK counterpart	main/secondary/referral/tentative/exclude; D3 A/B cannot be changed

Semantics entry	Required source-backed value
LPR3.patient_type and LPR3.admission	Verified inpatient and acute semantic equivalents
LPR3.diagnosis_role and LPR3.refutation	Qualifying roles and refuted/not_refuted meanings
LPR3.specialty	KONT_ANS_HOVEDSPEC mapped to psychiatric/somatic/exclude
LPR3.stay_semantics	Source verification of inpatient stay/contact semantics; keys and intervals are checked
hospital_eras and psychiatric_eras	Nonoverlapping lists of source (LPR, PSYK, LPR3), start, end; authoritative lineage, not a guessed 2019 cutoff
hospital_semantic_continuity	inpatient_acute, diagnoses, psychiatry set to equivalent only with source support; otherwise separate-era levels remain but cross-era contrasts are unavailable
operation_eras	Lists of source (LPR, PRIV, LPR3), start, end
operation_union_linkage	same_PNR only with authorized public/private equivalence
LPR3.operation_capture_scope	public_recorded or public_and_private_recorded, verified for the delivered extract
LPR3.procedure_natural_key	Verified list of delivered D1 key fields; no assumed universal identifier uniqueness
LPR3.contactless_flag	Raw flags mapped to contact/contactless
LMDB.transaction_state	finalized_records only with official reconciliation semantics; raw unreconciled correction logs remain unresolved
LMDB.correction and LMDB.sector	Positive/negative/reversal/exclude and community_person/hospital/exclude
ATC.validity	Exact delivered ATC code to date-valid intervals, from official historical licensed definitions
self_harm_external_cause_capture	complete only with documented external-cause ascertainment; otherwise narrower coded subset is retained separately

Semantics entry	Required source-backed value
payer_meanings	PRIV_FRITVALG.C_FRITVALG and LPR3.BETALER_BET_AFTALE maps; latter keys concatenate payer, vertical bar, agreement
safety.band_removal and safety.mesenteric_defect_repair	Optional exact_codes and valid_from with specific source evidence; no defaults supplied
baseline.contact_count_history, baseline.psychiatric_history, baseline.safety_history	Optional source-backed start/end dates for the descriptive baseline histories; these lookback starts are not stated in the frozen protocols, so absent resolution leaves those columns unavailable without blocking H or principal endpoints

SKS event-date validity uses the frozen docs/evidence/study-sks.csv, not a newer classification. Required codes missing from that extract remain unresolved. Historical ATC definitions are runtime inputs and are not mirrored from WHO. D1 supplies no verified precise departure-time field. The date-only D3 ordering is implemented; the finer emigration-day exception remains unresolved without a verified departure-time source, and is never inferred from unrelated timestamps.

Identity and disclosure

frozen-identity.json preserves the original registration digests and material hashes. native.py preserves the repository digest/parser/evaluator. Mutable Atom bodies, result metadata and current Molecule interpretation are excluded from registration identity. Protocols, membership, shared contracts, dictionaries and paper interfaces are checked. Absolute machine paths are never scientific IDs.

Predecessor evidence must match its supplied hash, registration identity, origin, legal state, core input binding and output hashes, and the registered filenames, schemas and principal grids must exist. H.csv must match its artifact hash AND the complete D2 reconstruction from bound inputs; the three cohort aggregate tables are also compared cell for cell. Reverification does not accept or rerun an otherwise/data_gap/no_result predecessor. D2 binding includes BEF/VNDS/LPR_ADM/LPR_DIAG hashes, vintages, coverage and relevant dictionary identities. Changes to optional LMDB inputs do not invalidate faithful H evidence. Runtime implementation hashes are recorded separately.

Scientific predecessors require a controller-managed attestation supplied through `--evidence-trust`, independently of the input manifest and producing results:

```
{
  "origin": "governed",
  "accepted_results": {
    "atom-000002": {
```

```

    "status_sha256": "SHA256_OF_REVIEWED_STATUS_JSON",
    "execution_identity": "REVIEWED_EXECUTION_IDENTITY_FROM_STATUS"
  }
}
}

```

The scheduler must protect this file and approve the producer/output binding; the analysis does not create it or automatically accept its own outputs. Tests use a separately labeled synthetic scheduler fixture. A terminal-only `no_result` can be consumed without positive attestation as a conservative no-retry veto; it never satisfies scientific activation. The callable accepts the equivalent `evidence_trust=PATH` keyword.

`source-manifest.json` authenticates every execution Python file and the frozen identity map against the controller-protected **World** reference. The run CLI checks these before scientific imports and again at `execute()`; a writable action cannot replace the trust root with its own manifest. Copy the entire execution directory. Execution identity is separate from registration identity and contains relative filenames/content hashes only. Changes to realized Atom bodies or the Molecule's current interpretation remain valid. The controller must protect the World, interpreter and launch command: in-process hashing is not a sandbox against a malicious replacement entrypoint that deliberately removes its checker. The runner never updates canonical Atom/Molecule files or manuscript slots.

Undisclosed aggregates and H/surgery rows stay in `private_output`. Governed exports and scientific state are suppressed until `disclosure.approved_payload_sha256` matches the computed aggregate payload and carries provider approval evidence. This permits a private review pass followed by execution to a new output root with exact approved content. Synthetic output is releasable by default because it is synthetic; `disclosure.require_review=true` exercises suppression while retaining that label. No identifiers enter public result JSON.

Every Atom writes `status.json`, `diagnostics.json`, `run-environment.json`, `delivery-provenance.json`, `component-status.csv`, `disclosure-log.json`, `deviations.jsonl` and `README.md`. Numeric modules also write `annual.csv`, `periods.csv`, `contrasts.csv`, `components.csv` and unidentified `causal-targets.csv`. Annual/period columns are the D4 `metric/period/group/stratum/clock/denominator_type/numerator/denominator_n/person_years/estimate/lower/upper/unit/mode/status/reason` fields, plus origin and scope/uncertainty provenance. Original denominators are fixed. A point-only `interval_unavailable` row has blank limits. Other unavailable or suppressed rows have blank numerical cells and explicit reasons.

Per-Atom executable index

For EACH entry the exact CLI is: `run.py -atom ID -world WORLD -inputs MANIFEST -output ROOT` with the ID printed below. The callable is `run.execute(ID, world, inputs_path, output, dispatch_policy="activation_respecting")`. All entries use `run_tests.py -output ABSOLUTE_EMPTY_SCRATCH`. Shared implementations do not replace the explicit within-Atom components listed here.

atom-000001 — Policy identification

Command: `run.py -atom atom-000001 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000001", world, manifest, output)`.

Implementation: `audit.identification_audit` and `audit.causal_targets`. Inputs: frozen I1–I3, D1, literature and public evidence; no register rows. Outputs: `evidence-matrix.csv` (predicate, URL, document date, locator, access, finding, status, implication), `status.json` and blank causal targets. Tests: boundary result despite chronology gaps, no causal numbers, figure 1. Limits: no fresh source retrieval; inherited access is labeled. Missing normalized brief, original boundary and referenced institutional/search ledgers remain explicit. No positive causal state exists.

atom-000002 — Historical clinical population

Command: `run.py -atom atom-000002 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000002", world, manifest, output)`.

Implementation: `Construction.cohort/population/residence/lpr2;`
`run.cohort_tables`. Inputs/provenance: D1 BEF PNR/REFERENCETID/FOED_DAG/KOEN/KOM/REGVNDS PNR/HAEND_DATO/INDUD_KODE; LPR_ADM PNR/RECNUM/D_INDDTO/D_UDDTO; LPR_DIAG RECNUM/C_DIAG/C_DIAGTYPE. Rules: D2; age at 2011-01-01, entry 2007-01-01. Outputs: `cohort-flow.csv` (step/reason/n/status), `baseline-summary.csv` (variable/category/group/n/denominator_n/status/reason), `denominator-status.csv` and private H.csv. Units: finite-source persons. Tests: age boundaries, anchors, migration interruption, conflicting DOB, missing IDs, duplicate children, future/invalid codes, partial R classification, forged cohort evidence, otherwise predecessors and empty groups. Limits: source-backed snapshot/migration meanings and historical completeness; optional medications/procedures do not gate H. Invalid/unknown R subtype records retain H and ALL; R is explicitly unresolved for those people, and dependent group denominators/contrasts are unavailable. Private H stores R_status/R_reason, with no silent R0 assignment.

atom-000003 — Recorded surgical access

Command: `run.py -atom atom-000003 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000003", world, manifest, output)`.

Implementation: `Analysis.access/operation_stream/financing;` `Construction.operations/strata;` `shared estimator`. Inputs: H/D2, DOD/VNDS, LPR_SKSOPR RECNUM/C_OPR/D_ODTO and ADM, PRIV counterparts, D1 LPR3 contact/pathway/procedure keys/dates/codes. Hospital histories support T; LMDB supports F. Financing uses PRIV_FRITVALG and LPR_A_BETALINGSOPLYSNINGER fields explicitly named in D1. Outputs: `annual/period stable_operations`, `first_recorded_operation_cumulative`, H/F/T, separate sleeve/endoscopic/reversal components, `capture.csv`, `financing.csv` and a private surgery-day ledger. Units: operations per 1000 original-person years, or cumulative events per 1000 original persons. Principal contrast: long-minus-pre R0-minus-R1. Tests: contactless pathways, contradictory links, distinct days, introduced-code status, missing private years/eras, unknown payer meanings and

optional failure with full per-component no_result recovery. Limits: captured provider scope only; no total access, first-ever surgery or causal first stage. Financing and private gaps do not erase public components. Each overlapping source must independently cover a union window. Incomplete union rows retain their exact reason; the main public-recorded fallback uses a consistent source scope across all years. A union label is never attached to the fallback's public counts. Unified later LPR3 records without verified ownership cannot supply a public-only subset.

atom-000004 — Acute hospital burden

Command: `run.py -atom atom-000004 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000004", world, manifest, output)`.

Implementation: `Analysis.hospital/episode_stream`; `construction.episodes`. Inputs: H/vital, D1 LPR_ADM acute/inpatient fields with reduced diagnoses, LPR3 contact/diagnosis/stay fields and verified continuity. Outputs: acute_all/acute_cv principal levels and change contrasts; heart failure, MI/stroke decompositions; overlap-only, any-position CV and separate long-era descriptions with concordance in components.csv. Units: episodes per 1000 original-person calendar years. Tests: transfers across year/entry, first acute date versus elective spell start, duplicate diagnoses, CV-only failure, missing eras, zero/degenerate intervals, and common-exit failure retaining sensitivities and every unfinished companion. Limits: failed phenotype mapping is component-specific; cross-era comparability requires authoritative semantics, while independently measurable eras remain.

atom-000005 — Recorded diabetes incidence

Command: `run.py -atom atom-000005 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000005", world, manifest, output)`.

Implementation: `Analysis.incident_diabetes`; `Construction.strata/drugs`. Inputs: F requires complete 1996–2006 BEF/VNDS/hospital/LMDB history. Pharmacy uses PNR12/EKSD/ATC/KORR/SEKTOR/VNR with authorized linkage and finalized-record semantics. D1 contact starts/diagnoses/refutation and DOD/VNDS supply follow-up. Outputs: t2_cumulative, 2024 R0-minus-R1, competing partition, A10 initiation, overlapping baseline exclusion counts (prior drugs, diabetes types, obstetric diabetes and residence), gestational-only descriptor, uncertain-diabetes endpoint, first-contact type, contact starts and diagnosis/medication discrepancy. Units: cumulative events per 1000 original F people; contact starts use years. Tests: DO241, same-day non-T2 priority, DO244 continuation, historical DO245 invalidity, negative-history requirements, pre-1996 invariance, entry-day events, uncertain subcodes and cumulative arithmetic. Limits: no F without pharmacy/residence negatives; inpatient classification is a supplementary descriptor and cannot gate principal diagnosis dates. First outcome/competing diabetes records are selected at or after 2007 entry; pre-1996 records cannot suppress post-entry incidence. Date-invalid or unknown baseline diabetes subcodes assign the affected person to U with a reason, while other verified F/T persons remain usable. Missing codes in the frozen extract are unresolved; a documented invalid event date is an evidenced component gap.

atom-000006 — Diabetes treatment burden

Command: `run.py -atom atom-000006 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000006", world, manifest, output)`.

Implementation: `Analysis.treatment/drug_months`, `Construction.strata`, `episode_stream`. Inputs: hospital-defined T from 1996–2006 history; H/vital; finalized LMDB for medication, inpatient/diagnosis fields for hospital burden. Outputs: `a10_months` and `t2_inpatient` with separate change contrasts; A10A/A10B, annual no-dispensing proportions, recorded duration $<2/2-5/>5$ years. Units: dispensing months or inpatient episodes per 1000 original-person years, never pooled. No-dispensing is a proportion, not remission. Tests: duplicate/multiple same-month fills/classes, optional LMDB loss with retained hospital and mortality, complete header-only LMDB, unresolved subtype siblings, unit separation and discordant state logic. Limits: unresolved corrections block drugs only; no dose, DDD or laboratory proxy.

atom-000007 — Psychiatric treatment

Command: `run.py -atom atom-000007 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000007", world, manifest, output)`.

Implementation: `Analysis.psychiatric/contact_events/episode_stream/drug_months`. Inputs: H/vital; PSYK_ADM/DIAG D1 fields, somatic acute/external-cause records, verified LPR3 psychiatric specialty/diagnosis continuity; optional LMDB. Outputs: `psych_starts/self_harm` and separate change contrasts; DF10 admissions, four psychotropic classes/union, inpatient/main-only/merge sensitivities and baseline DF history. Units: contact starts, episodes or dispensing months per 1000 original-person calendar years, with distinct labels. Tests: independent PSYK loss and retained self-harm, source bridges, pointwise state composition and figure grid. Limits: complete external-cause capture requires positive evidence; narrower coded subsets remain visible. No visits inferred from long pathways and no suicide mortality inferred from DOD.

atom-000008 — All-cause mortality

Command: `run.py -atom atom-000008 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000008", world, manifest, output)`.

Implementation: `Analysis.mortality/exit_events`, `Construction.vital`. Inputs: H, BEF contradiction checks, DOD PNR/DODDATO and VNDS PNR/HAEND_DATO/INDUD_KODE. No postbaseline hospital/drug/procedure input. Outputs: `death_cumulative`, 2024 R0-minus-R1, emigration and annual first-death increments, per 1000 original H people. Tests: death/emigration ordering, fixed denominators, missing vital history, absent predecessors, direct dispatch, no-result prohibition, corrupt evidence, mutated and relocated read-only Worlds. Limits: domestic death before first emigration; no hazard model, causes of death, censoring extrapolation or equivalence claim. Death wins a death/emigration tie in healthcare filtering, operation windows, first exits and alive/resident days. Post-death contradictions remain logged and invalidate affected windows. Complete zero-event deliveries

retain zero points with the registered degenerate-interval disposition and all annual increments.

atom-000009 — Surgical safety

Command: `run.py -atom atom-000009 -world WORLD -inputs MANIFEST -output ROOT`. Callable: `run.execute("atom-000009", world, manifest, output)`.

Implementation: `Analysis.safety`; `safety.execute_safety`; `surgery/episode` construction. Inputs: H/vital, verified named surgery records, all inpatient stays including elective admissions, and D1 diagnoses. No access sign or payer result is required. Outputs: `comp_hospital/repeat_procedure` population change contrasts (events per 1000 original-person years); separate index flags, readmissions, stable repeats, KJW, nutrition/malabsorption/hypoglycemia, baseline histories and sensitivities. Exactly eight figure rows: `window_first_event`, `potential_complication` or `gi_reoperation`, ALL/H, operation clock, `first_postentry_operation`, `first_postentry_operation_cohort`, `entry_2007_2019`, windows 0-30/31-90/91-365/ 366-1825, events per 1000 operations. Recurrent windows, measurable 1-30 later-date repeats and unresolved full 0-30 repeats remain separate. Tests: elective index flags, first-window union oracle, fixed operation denominators, later entry eligibility, death/emigration/event ties, public-scope fallback, same-day limits and exact figure keys. Limits: index flags have uncertain onset; KJW is general GI reoperation. Band removal/mesenteric repair require exact source-backed definitions. Population index flags use episode-start date (D3/step 3); the same flag is day zero on the conditional clock. Recipient descriptions are selected on treatment.

Environment, testing and figures

Tested Python 3.12.4, NumPy 1.26.4, pandas 2.2.3, SciPy 1.15.2, PyYAML 6.0.2, Matplotlib 3.10.0, PyMuPDF 1.24.9. PyMuPDF is used only to inspect PDF dimensions/text. The engineering report records its installed version and exact test results. No R or Stata engine is needed or substituted; no shared environment was changed.

```
OPENBLAS_NUM_THREADS=1 OMP_NUM_THREADS=1 PYTHONDONTWRITEBYTECODE=1 \
/home/shaoerzhuo/anaconda3/bin/python /ACTION/execution/run_tests.py \
--world /READ_ONLY_WORLD --output /ABSOLUTE_EMPTY_SCRATCH
```

Tests generate their own scratch files. Independent explicit resampled histories and hand-calculated rates/fractions check the I5 cluster bootstrap: 9,999 draws, seed 20260905, NumPy PCG64, linear quantiles, original denominators, 30-municipality support and >1% undefined draws. No invented variance formula or nuisance model.

For approved aggregate rendering:

```
/home/shaoerzhuo/anaconda3/bin/python /ACTION/execution/render_figures.py \
--world /READ_ONLY_WORLD --results /GOVERNED_RESULTS \
--output /ACTION/figures --width-mm 130.7 --style-dir /RUNTIME_STYLE
```

All seven unchanged interfaces are tested with numerical, partial and absent synthetic tables. Their original long-note wrapping can clip at 130.7 mm. `render_figures.py` preserves text, data, panels, width and font binding while disclosing an in-memory wrapping repair; original template hashes are logged. Figure 1 is paginated at whole predicates, with figure pages at most 170 mm high at 130.7 mm width. `figure1.pdf` contains every page; `figure1-page-N.pdf` and `figure1-continuations.tex` supply the continuation binding. The unchanged paper shell includes only PDF page 1, so the presentation driver must include the continuation TeX immediately after the existing Figure 1 float. This mechanical binding is exercised only in scratch; original paper/template bytes stay frozen. Other figures whose complete status notes exceed the page budget retain their original statistical panels and move the full notes to continuation pages, with the same `figureN-page-K.pdf` / `figureN-continuations.tex` convention. Include each continuation immediately after its existing figure float. No partial note or unavailable component is discarded. Test 36 compiles this exact copied binding. Local rendering uses DejaVu Sans. The four Helvetica Neue files were absent from this study's supplied resources. The prior Opus reviewer located a public font bundle in another study's stage inputs. Round 2 also tests all seven interfaces with that explicitly supplied resource; its path and checks are in the engineering report. That resource is not a font supply assumed by this runtime. To test an explicitly available font resource, add `--style-dir /PUBLIC_STYLE` to `run_tests.py`. Fonts are neither copied into this package nor assumed to be available in a governed Danish execution environment.

Unexpected computation failures retain completed rows and materialize each unfinished registered component/grid from `inventory.py`, including common death/emigration and person-day companions. The same inventory supports absent and unactivated dispositions. It contains output keys only, not another design. Unresolved numeric components use D4 `data_gap` with the exact `STOP_UNRESOLVED_SOURCE` reason; outer native `otherwise` remains distinct. In particular, unknown financing cannot erase otherwise computable surgery rows.

Passing synthetic tests is not empirical replication, causal validation, scientific acceptance, data availability or disclosure approval. Opus/Sol reviews are separate controller stages and are not claimed by this implementation author.

Engineering supplement

Author implementation report — round 2

This round revises the existing reference implementation in response to both round-1 engineering reviews. It preserves all nine Atom IDs, every registration, the full Molecule, paper prose, manifest, source evidence and original figure templates. All 90 original files were compared with `.controller/source` and remain byte-identical. All new/changed files are inside `execution/engineering`; all generated fixtures, results and previews are in `scratch/r02/author`.

The frozen scientific ceiling is unchanged: I1–I3 forbid a causal estimator. Historical H/R descriptions, F incidence, T burden, access and safety are the supported analyses.

No matching, weighting, DiD, RD, IV or survival-model substitution is licensed or implemented. Their absence is source fidelity.

The author read the required skills/references, every full Atom protocol and result partition, the full Molecule registration, the shared data/identification/ governance documents, all existing execution code and the paper/figure interfaces. This is the original adaptive study, with no prereg/code/ or prereg/replication/ directory. The author also read both round-1 reviews and rechecked the 23 local schema-document hashes and all 97 requested fields against the frozen ledger. No new table list, code revision, eligibility definition or policy date was added. No live search was used in round 2; inherited URL/access limitations remain as documented in the frozen evidence. No confidential data, old empirical sessions, measured study outcomes or QGPU were accessed. No agents were spawned.

Responses to every prior reviewer finding

Finding	Source-faithful repair and regression
Opus F1; CODEX-R01-003	<code>construction.first_exit</code> implements D3 death-first ties. Healthcare filtering, first exits, observed person-days and conditional safety use that same rule. The existing post-domestic-death contradiction branch is retained. Test 05 now expects two death-day records for the tie person, and independently expects 367 days for both death-only/tied exits. Test 35 checks a day-10 complication, KJW and death against a one-person operation cohort; emigration remains zero.
Opus F2; CODEX-R01-005	Incident T2 and competing-diabetes candidates are restricted to contact dates at/after 2007 entry before first-event ordering. Baseline F/T uses the separate frozen 1996–2006 window. Test 27 adds pre-1996 type-2 and type-1 records under a 1977 source era, verifies invariant 38/64 incidence, and checks baseline-window, entry-day and same-day competing records.

Finding	Source-faithful repair and regression
Opus F3	<code>coded</code> distinguishes an absent frozen SKS code (unresolved) from an invalid event date (evidenced gap). Per-record catches preserve H. R_status/R_reason and blank R prevent silent R0 assignment; affected group denominators/contrasts are unavailable while ALL is retained. Unresolved baseline diabetes histories assign only affected persons to U, with reasons, leaving verified F/T siblings. Test 28 exercises both missing/invalid R subcodes and invalid obstetric history, including the complete Atom 6 hospital path.
Opus F4	An otherwise H predecessor yields an unresolved boundary under direct dispatch, not data_gap. Default dispatch remains not_activated. Test 34 uses a genuinely unresolved cohort run plus explicit synthetic scheduler attestation; no reconstruction retry occurs.
Opus F5; CODEX-R01-007	<code>inventory.py</code> enumerates the existing registered output positions. Failure salvage retains completed rows and fills each unfinished annual/period/component/contrast position with no_result. The component key distinguishes annual rows from cumulative landmark rows. Tests 25 and 31 inject financing and common-exit failures and check private capture, prior surgery, all death/emigration companions, person-days and retained sensitivity estimates.

Finding	Source-faithful repair and regression
CODEX-R01-001	<code>source-manifest.json</code> authenticates execution files against the controller-protected World before scientific CLI imports and again before execution. The action-local manifest cannot replace that trust root. Test 33 changes every Python source class and the frozen identity map separately, rejects each before output, and tries a changed estimator plus forged local source manifest. Test 15 still accepts an exact relocated copy with realized Atom/Molecule body changes.
CODEX-R01-002	Scientific predecessors require a separately supplied trusted scheduler attestation of status/output binding and execution identity. Registered inventories/schemas/grids are checked. Historical-ready H and its cohort summaries are rederived from the bound D2 inputs and compared exactly; the analysis cannot attest itself. Test 32 supplies self-hashed dummy output and a delivery-extraneous H identifier, including a deliberately attested synthetic forgery. Optional LMDB changes retain legitimate H evidence (test 11). Terminal-only <code>no_result</code> remains a conservative veto, never positive activation.
CODEX-R01-004	Each declared operation source contributes its own required-calendar gaps, so public coverage cannot mask private gaps. Atoms 3 and 9 share the same coverage-based public fallback. Incomplete union rows remain separately labeled; public points never acquire a union label. Test 30 checks a one-year private gap and entirely absent private sources for both full Atom paths; test 38 checks an omitted private source era.

Finding	Source-faithful repair and regression
CODEX-R01-006	Explicit boolean <code>.loc</code> masks preserve columns on complete empty event frames. Test 29 runs full CLIs for header-only DOD and LMDB deliveries: zero death/drug-month points, all 54 increments/no-dispensing rows, registered interval_unavailable, and no operational terminal.
CODEX-R01-008	The execution rendering adapter paginates Figure 1 at whole predicates. Physical inspection also found over-height status notes on other partial displays; those notes now continue on separate pages without changing statistical panels, quantities or text. The copied paper shell receives explicit continuation inputs in scratch only. Tests 17/36 check page dimensions, glyph bounds, all audit text, font binding and paper compilation. The frozen single-page include alone is insufficient for a multipage figure; this is documented rather than silently dropping continuation pages.

These are engineering repairs to source-supported behavior, not scientific amendments. An unresolvable R does not establish absence of disease; U does not become a laboratory-negative F. Choosing public-recorded capture is the D3 registered scope restriction, not a replacement treatment definition. Source coverage, not observed outcomes or signs, determines that branch.

Two additional interface checks complete this repair: test 37 exercises every unactivated annual/period/component grid for Atoms 3–9 and all their figure interfaces. Test 39 checks Atom 3 step 6: missing payer meanings yield numeric status data_gap with the exact `STOP_UNRESOLVED_SOURCE` reason, while the entire surgery annual table is unchanged. D4 status normalization does not alter native outer otherwise/unknown semantics or invent an unavailable estimate.

Execution trust and remaining boundaries

The runtime supplies explicit input paths/dictionaries and, when consuming scientific predecessors, `--evidence-trust /TRUSTED_SCHEDULER/accepted-results.json`. The trusted scheduler must protect the World, interpreter, launch command and attestation; a writable input/result file cannot approve itself. In-process hashing is not a security sandbox against a malicious replacement interpreter or endpoint that

removes its own guard. No signing key or fabricated controller acceptance is bundled. Absent scientific attestation rejects evidence consumption; direct dispatch with no predecessor can still perform local registered D2 work.

Registration identity excludes realized Atom result/body fields and the current Molecule interpretation; execution identity is separate. All scientific identities use relative names and content, never absolute machine paths. The original host manifest/CHECKSUMS were not resealed; the new source-manifest covers the executable addition within this author-owned directory.

The exact source-boundary table in the preserved engineering record below remains applicable: causal targets; absent normalized brief/original boundary and referenced institutional/search ledgers; source-silent baseline lookback starts and exact band-removal/mesenteric-repair definitions; raw LMDB correction reconciliation; private payer/provider labels; historical ATC; source bridges; finer emigration-day ordering; and introduced-code/same-day-repeat limitations. No source-silent value is filled automatically. Clinical dictionaries and delivery declarations remain runtime evidence, not proof of access. Full-scale performance and confidential provider disclosure remain untested.

All Atoms retain executable entries and precise input/output/test descriptions in execution/README.md. Its per-Atom coverage and the preserved coverage table below remain the complete supported program; these repairs do not delete siblings.

Current-round validation

The first expanded run (`scratch/r02/author/test01`) executed all nine Atoms and 34 test groups in 198.770 seconds. It found 4 assertion failures and 3 errors, all traced to two new engineering mistakes: a legitimate exported `mode` column was missing from reconstructed cohort-summary comparison, and cumulative landmark companions were merged with same-year annual companions. The forged-H check was also stopped by the first mistake before reaching its intended assertion. Both mistakes were corrected; this initial run is not represented as a pass.

The second expanded run (`test02`) ran 36 groups in 223.797 seconds and found one failure and one error. A forged H was rejected inside the analysis handler, which mislabeled the rejection as an operational `no_result`; verification now occurs before dispatch/output creation. The production-font test had a path construction typo, corrected in the test itself. `test03` was interrupted during test 12 after tests 1–11 passed: a separate late-stage paper probe had exposed the copied read-only paper root, so that test setup needed repair. It has no completed test-report and is not counted as a pass. The isolated `figure-binding-probe` failed at that permission boundary; after making the scratch copy writable, `figure-binding-probe2` passed production-font rendering and two paper compilation passes.

`test04` passed all 38 groups, zero failures/errors, in 232.876 seconds. It compiled the 20-page synthetic paper binding with unfilled result slots. Final inspection then found the optional financing status vocabulary mismatch described above; that small serialization repair and test 39 triggered a fresh full run. The final run and integrity results are recorded immediately below.

Final round-2 validation

scratch/r02/author/test05/test-report.json records **39 test groups passed**, zero failures and zero errors, in **235.391 seconds**. This final run executes all nine Atoms and includes the independent 9,999-draw resampled-person-history oracle, hand-computable event/denominator/contrast checks, all reviewer regressions, both dispatch policies, complete zero-event deliveries, scoped missingness and component-level operational failures. No test was skipped. The CLI `--help` also completed without data or input paths.

Exact final command (all generated outputs are outside the World):

```
OPENBLAS_NUM_THREADS=1 OMP_NUM_THREADS=1 PYTHONDONTWRITEBYTECODE=1 \
/home/shaoerzhuo/anaconda3/bin/python \
/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-code-2026090
  ↳ 6/bariatric-surgery/v002/world/prereg/execution/run_tests.py
  ↳ \
--world /home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-code
  ↳ -20260906/bariatric-surgery/v002/world
  ↳ \
--output /home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-cod
  ↳ e-20260906/bariatric-surgery/scratch/r02/author/test05
  ↳ \
--style-dir /home/shaoerzhuo/Bolero-denmark/.prereg-inputs/techbridge-front
  ↳ ier-20260905/runtime-style
```

The unchanged environment is Python 3.12.4, NumPy 1.26.4, pandas 2.2.3, SciPy 1.15.2, PyYAML 6.0.2, Matplotlib 3.10.0 and PyMuPDF 1.24.9. The paper engine is `/usr/bin/pdflatex`, pdfTeX 1.40.22 (TeX Live 2022/dev/Debian). No required engine was missing in this final check. The registered program requires no R/Stata estimation engine. No software was installed or replaced.

All seven fixed figure interfaces execute on generated synthetic tables, with partial/absent/unactivated dispositions exercised separately. The explicitly supplied four Helvetica Neue fonts were tested on every production PDF page; font identities and glyph bounds passed. Every page is 130.7 mm wide and at most 160.528 mm high. Figure 1 has three pages; Figures 4–6 have two pages each; the others have one page. All audit predicates and complete notes are retained. `test05/paper-smoke.json` records two successful compilation passes of the 20-page scratch-only manuscript binding, no oversized floats, and result slots still unfilled. The continuation TeX binding is necessary because the frozen paper shell includes only the first PDF page. No original paper, result slot or figure template was altered. Font files were neither bundled nor copied into the World; a governed runtime must supply them explicitly.

Final integrity verification rechecked all 90 original files against the immutable source, with no differences, no additions outside the authorized execution/engineering directories, and no World bytecode. The 12 Python modules and frozen identity map authenticate successfully against `source-manifest.json`. The registration and execution identities, environment, physical figure sizes, font hashes and test result are recorded in `validation-summary.json`. Identity checks also accepted relocated, read-only Worlds with mutable realized bodies and rejected changed protocols, corrupted results, forged H and altered code.

The source-boundary table below remains the exact limit on numerical coverage: source-silent definitions are unresolved, unavailable essential delivery inputs retain an honest boundary, and all causal targets remain not `_identified`. The synthetic pass is engineering evidence only, not empirical replication, causal validation, scientific acceptance, data availability or disclosure approval. All 13 findings from the prior Opus/Codex reviews are answered above. Independent round-2 Opus and Codex Sol xhigh reviews remain controller stages; this author neither spawned reviewers nor claims their approval.

Preserved round-1 engineering record

The remainder records the preceding author round and its then-current claims; the reviewer responses and current-round validation above supersede those claims where a defect was found. Its test results refer only to the original round-1 implementation and must not be read as validation of round 2.

The execution bundle implements the frozen nine-Atom descriptive program and its identification audit. It does not implement a causal estimator: I1–I3 explicitly forbid one. The registration remains user-frozen and independently scientifically unaccepted, as stated in its original packaging decision.

All work is pre-data. Only public schema/source documents and this package were read. No confidential Danish/APTO rows, measured study outcomes, old empirical sessions or remote QGPU were accessed. No agent was spawned; no messages were sent to external people; no commit, push, release or shared-environment change was performed. All author writes are under execution/, engineering/, or the authorized round-1 author scratch. The original 90 files were byte-compared against `.controller/source` with no differences; no World bytecode was created. The original manifest and CHECKSUMS files remain unchanged under the write-scope restriction. New execution sources have their own per-run content hashes; this author did not reseal or release the package.

Authority and coverage

Read in full: `tools/prereg-lane/AGENTS.md`; `predata-engineering`, `preregistration-package` and its three references; adaptive and canonical skills and adaptive foundations; paper-to-replication skill (the package itself has no replication directory); all nine full Atom registrations/result regions and the full Molecule registration; `data/identification/governance/literature`, source evidence, package freeze decision, paper, result map, roster and all figure code. No existing analysis code or `prereg/code/` was present. The native `digest/parser/evaluator` was meaning-preservingly vendored from `tools/prereg-lane/src/prereg_lane/native.py`; it is not a substitute estimator.

The README contains one labeled entry for each exact Atom, its CLI/function, implementing files, source inputs, output columns/units, tests and limits.

Atom	Implemented registered components
atom-000001	Documentary predicate matrix; January/July conflict; all regions; missing strict clinical constructs/counterfactual; ordered not_identified boundary; unidentified targets; figure 1
atom-000002	Exact age/time-zero/obesity history; residence anchors/events; source-key assertions and diagnosis semi-join; fixed R; cohort flow/denominators/baseline summaries; optional unresolved history column; private H
atom-000003	Source-aware public/private/LPR3 surgery-day construction, contactless pathways, code validity and introduced-code limits; stable rates and first-recorded cumulative fractions; F/T; capture/payer/prior-operation descriptions
atom-000004	All inpatient spell assembly and first acute date; all-cause/CV principal endpoints; HF/MI/stroke; next-day versus overlap-only, any-position CV and era splits; fixed change contrasts/concordance
atom-000005	Local F; definite/competing/gestational diabetes ordering; cumulative first events with fixed N; drug initiation; contact-type/starts; discrepancy tables and competing partition
atom-000006	Local hospital T; type-1 contradictions; calendar drug-month indicators, A10A/A10B, no-dispensing proportion; acute/elective T2 inpatient spells; recorded duration; separate contrasts
atom-000007	Specialist DF contact starts; self-harm, alcohol, class/union psychotropic months; inpatient/main-only/merge sensitivities; independent scope failures and baseline-history boundary

Atom	Implemented registered components
atom-000008	Independent DOD/VNDS/BEF checks, first domestic exit, death-first ties; original-N cumulative death/emigration and first-death increments; 2024 difference
atom-000009	Elective index flags and readmissions, most-recent operation anchoring, distinct repeats/KJW and union; fixed first-operation cohort; eight figure rows, recurrent and later-repeat windows, competitors, late conditions, sensitivities and introduced-code/source-gap components

There are no regression nuisance models. “Rank deficient” regression groups and modern DiD/RD/survival inference are not applicable to this registered estimator. Small/empty groups and degenerate event information are instead handled through the registered denominator and bootstrap guards. No unsupported statistical experiment was added to satisfy test coverage.

Meaning-preserving engineering

- Dates are normalized to documented Danish local ISO encodings. Birth-date age is distinct from enrollment; contact selection date is distinct from the operation date, first acute admission and the first-operation clock.
- Source child tables are reduced or joined many-to-one. Exact duplicates are removed; contradictory keys block the affected construction. A contactless procedure uses its unique pathway person and is not broadcast across contacts.
- Carry-in inpatient contacts remain present before 2007 so a transfer does not invent a new follow-up admission. Original H/F/T denominators remain fixed through death/emigration; first-exit histories are required from entry.
- Disjoint delivered calendars are tracked as intervals. A missing hospital year blocks cumulative histories but does not automatically erase a later separately complete recurrent period. Missing vital history blocks later domestic observation because the first emigration is then unresolved.
- The municipality bootstrap uses cluster sufficient statistics. In each draw, numerator equals the sum of complete-history cluster totals times cluster multiplicities; original denominator is recomputed by the same multiplicities. This is algebraically identical to copying person histories in each sampled municipality, including the fixed first-operation subset. Draw count, seed, percentile interpolation, support and undefined-draw guards are I5.

- Source-era continuity, provider scope, correction logic, person equivalence and dictionaries are explicit source-backed runtime inputs. The runtime cannot use them to alter frozen clinical codes, populations or estimator choices.
- An unexpected operational failure preserves completed components and emits `no_result` for unfinished work. It cannot overwrite them with zeros/nulls.
- Independent scientific/material identities exclude mutable Atom/Molecule realization bodies and absolute paths. Per-run code hashes remain separate. Predecessor outputs, H artifact and core delivery/dictionary binding are checked.
- Disclosure is an exact computed aggregate-payload approval, not a guessed provider threshold. Undisclosed tables and state stay private. Synthetic hold tests retain their synthetic origin.
- Fixed templates retain scientific content. A separately logged in-memory wrapping adapter repairs long-note clipping; no original figure was edited.

Population index-stay flags are dated to the inpatient episode start under D3 and the safety episode-counting rule. The same onset-uncertain flag contributes at day zero on the first-operation clock. This translation is explicit rather than silently moving a hospital event to its surgery date. The index-stay onset cannot be interpreted as postoperative incidence.

Source and runtime boundaries

Affected target	Exact frozen locator and disposition
Every causal policy/surgery quantity	identification.md I1–I3; atom-000001 steps 3–6. Registered <code>not_identified</code> boundary. No estimator or positive activation exists
Complete documentary reconstruction	atom-000001 step 1 and identification.md I2 reference a normalized brief, original data-boundary file and institutional-ledger.yaml; these are not in the supplied World. literature.md also references absent search-and-screening.yaml. The matrix records these gaps and retains the indispensable-construct boundary
Pre-2007 contact-count categories	atom-000002 step 3 specifies categories but no lookback start. No silent inheritance of R’s separate 2003–2006 window. Source-backed <code>baseline.contact_count_history</code> is required; absent resolution yields status-only categories while H remains ready

Affected target	Exact frozen locator and disposition
Baseline psychiatric history	atom-000007 population/clinical-scope prose names baseline history without a lookback start. baseline.psychiatric_history requires exact source evidence; otherwise that supplement stops unresolved
Baseline nutrition/hypoglycemia history	atom-000009 step 5 requests histories without an explicit lookback start. baseline.safety_history requires exact source evidence; no default is supplied
Band removal/mesenteric-defect repair	atom-000009 step 3 names components but no exact code set. STOP_UNRESOLVED_SOURCE unless specifically verified runtime resolution is supplied; frozen SKS validity still applies
Postdischarge complication where index discharge cannot be found	atom-000009 step 2. The affected population component is unresolved; operation-clock recorded episodes can remain separately measurable
Historical sleeve/endoscopic sleeve/reversal	D3 and atom-000009 step 6: before 2013/2018/August 2020 respectively, no historical zero; full historical conditional introduced-code target unavailable
Full 0–30 repeated primary surgery	atom-000009 steps 3–4: same-day primary repeats cannot be distinguished from a surgery day. Status-only full target plus measurable 1–30 later-date component
F without negative pharmacy/residence history	D2; atom-000005. No hospital-only replacement. T's hospital definition and whole-H endpoints remain independent
Unreconciled LMDB transaction log	D1; atom-000006 step 2. The available projected fields do not supply a universal transaction-link/reversal algorithm. A source-certified finalized-record view is accepted; raw unresolved logs stop the medication component
Clinical roles, migration labels, psychiatric/external-cause capture, LPR3 bridge, payer/provider linkage	D1/D3/D5 and individual ordered protocols. Public field existence does not establish delivery-vintage labels or capture. Required source-backed mappings remain runtime inputs

Affected target	Exact frozen locator and disposition
Healthcare before emigration on the same calendar date	D3 exception requires verified departure-time order. D1 supplies a date field but no verified finer departure-time measurement. Date-only exclusion is implemented; timestamps on unrelated fields do not resolve the exception
Precise production font rendering	Round 1 did not test the four Helvetica Neue files required by plot_style.py. Round 2 supersedes that limitation using an explicitly supplied public font resource and tests every PDF page. The governed runtime must still supply the licensed files explicitly; they are not bundled here

Runtime resolution metadata must cite an existing source-supported definition. A user-written dictionary value, a synthetic example or a catalog coverage span does not authorize a new scientific choice. Source-silent choices remain stopped.

Public schema verification

On 2026-09-06 the author read the local FSV pages named in the frozen schema-`ledger.yaml` and retrieved exact named field rows with `rg`. All 23 local document hashes match the frozen ledger. All 97 execution field projections were found on their named FSV pages. The per-document check is retained in `schema-document-checks.json`. This is field/document verification, not runtime access, sample coverage or outcome validation.

Public URLs and existing extraction access levels remain in the frozen schema-`retrieval.md/literature.md/identification.md` and generated audit matrix. No live internet query was performed in this author round. No new classification version, policy date or table whitelist was imported. The original package's documented mapping is the authority; no catalog row count was used as a sample count or feasibility claim.

Tests and actual results

Python: `/home/shaoerzhuo/anaconda3/bin/python`, 3.12.4. Numerical/runtime libraries: NumPy 1.26.4, pandas 2.2.3, SciPy 1.15.2, PyYAML 6.0.2, Matplotlib 3.10.0. PDF inspection: PyMuPDF 1.24.9. `requirements-tested.txt` records these versions. No environment was installed or replaced. No R/Stata engine is necessary for these registered descriptive models.

The CLI `-help` executed successfully without real inputs. Synthetic tests use invented identifiers, complete and deliberately incomplete delivery descriptors, and fixture-only dictionaries. All outputs remain under the author scratch tree.

Command (the numbered directory changes between checks):

```
OPENBLAS_NUM_THREADS=1 OMP_NUM_THREADS=1 PYTHONDONTWRITEBYTECODE=1 \
/home/shaoerzhuo/anaconda3/bin/python \
/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-code-2026090 \
↳ 6/bariatric-surgery/v001/world/prereg/execution/run_tests.py
↳ \
--output /home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-cod \
↳ e-20260906/bariatric-surgery/scratch/r01/author/test06
```

Earlier executed checks: - Initial all-Atom smoke exposed a missing import in financing; corrected. - test01: 17 groups, 16 passed, one fixture error from inheriting read-only copied permissions before mutating the synthetic realization. Fixture setup repaired. - test02: 20 groups passed in 107.967 seconds. - test03: 23 groups passed in 109.618 seconds. - test04: 24 groups passed in 112.712 seconds, including source-silent baseline history handling. - test05: 25 groups passed in 116.463 seconds, including injected optional operational failure preservation. This recovery branch emits a pandas FutureWarning about future concatenation dtype behavior; its numerical and missingness assertions pass on the pinned pandas 2.2.3 environment. - test06 (final implementation): **26 test groups passed**, zero failures and zero errors, in **129.532 seconds**. This includes public/private same-day deduplication, a hand-checked paid surgery count, prior-metformin F exclusion, overlapping baseline exclusion counts, and all earlier coverage. Machine-readable results: scratch/r01/author/test06/test-report.json under the task workspace. All numerical output and figure artifacts remain in that scratch directory; none was copied into the frozen World.

Tests cover every Atom's supported main path, scoped missing inputs, temporal/ code/age boundaries, conflicting and duplicate keys, different event clocks, empty/singleton/degenerate groups, medication month reduction, competing diabetes and exit ties, original-N cumulative arithmetic, multi-operation safety windows, point-wise state regions, and both dispatch policies including absent/no-result predecessors. The bootstrap oracle independently copies sampled complete person histories in Python and compares all 9,999 draws and quantiles; fixed contrasts, calendar-year rates and safety first-window unions also have hand-computable expectations. Tests are not implementation shape checks alone.

The deployment check copies execution code into an action directory, mutates only synthetic realized Atom/Molecule bodies, makes the relocated World read-only, and runs the copied CLI to an external output root. Faithful predecessor evidence is accepted; protocol changes, corrupt evidence and wrong core bindings are rejected. The source World is never mutated by these tests.

Every original figure renders from actual generated aggregate files with complete, partial and absent inputs. PDF width is independently checked at 130.7 mm. The original long-note clipping was visually inspected; the adapter was checked using PDF glyph bounds and visual inspection of hospital/safety partial renders. Generated PDFs/PNGs are scratch artifacts. No manuscript slot was filled.

Review handoff and limits

There were no prior engineering reviewer findings in round 1. Accordingly no reviewer-response item is omitted. Adversarial Opus and Codex Sol xhigh checks have not been performed by this author: this invocation is role-author and explicitly prohibits spawning agents. They remain independent controller stages; this report does not claim their approval.

Synthetic execution establishes only the tested engineering behavior and source bindings. It is not empirical replication, causal validation, scientific acceptance, proof of confidential data availability, or provider disclosure clearance. The registered causal question remains unanswered. Full-scale Danish extracts were not benchmarked. This is an in-memory projected CSV reference implementation; governed resource requirements and actual delivery calendars remain unverified. A resource failure is operational no_result and cannot become a statistical null.

Reference implementation review

Engineering status: REVIEW INCOMPLETE. Review rounds: 3. Revision slots used: 2 (initial draft excluded).

User-directed bounded handoff: no more than two author revisions. Proceeding to formatting is not reviewer acceptance. Failed/missing reviewer calls have no scientific verdict; original records remain available below.

This augmentation used schemas, documentation and synthetic fixtures only. Code review and package compilation do not establish scientific validity, empirical replication, data availability or independent acceptance of the original science. Original registrations, manuscript sources and scientific review remain unchanged. Unresolved source definitions remain unresolved; runnable components and blocked targets must be distinguished in prereg/execution/README.md.

The host checks prose Atom coverage, Python syntax and synthetic commands. These are engineering checks, not a scientific verdict.

Controller checks and review dispositions

```
{
  "round": 3,
  "accepted": false,
  "host": {
    "status": "pass",
    "findings": [],
    "processes": [
      {
        "label": "r03-host-run",
        "command": [
          "/home/shaoerzhuo/anaconda3/bin/python",
          "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-cod
          ↪ e-20260906/bariatric-surgery/scratch/r03/host/attempt-01/world/
          ↪ prereg/execution/run.py",
          "--help"
        ],
        "model": null,
      }
    ]
  }
}
```

```

    "cwd": "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-referenc
    ↪ e-code-20260906/bariatric-surgery/scratch/r03/host/attempt-01",
    "log": "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-referenc
    ↪ e-code-20260906/bariatric-surgery/logs/r03-host-run-a01.log",
    "created_at": "2026-09-06T11:37:41.243475+00:00",
    "status": "finished",
    "pid": 2413733,
    "start_ticks": "83273615",
    "state": "R",
    "started_at": "2026-09-06T11:37:41.250594+00:00",
    "returncode": 0,
    "completed_at": "2026-09-06T11:37:41.821640+00:00"
  },
  {
    "label": "r03-host-run_tests",
    "command": [
      "/home/shaoerzhuo/anaconda3/bin/python",
      "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-cod
      ↪ e-20260906/bariatric-surgery/scratch/r03/host/attempt-01/world/
      ↪ prereg/execution/run_tests.py",
      "--output",
      "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-cod
      ↪ e-20260906/bariatric-surgery/scratch/r03/host/attempt-01/output"
    ],
    "model": null,
    "cwd": "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-referenc
    ↪ e-code-20260906/bariatric-surgery/scratch/r03/host/attempt-01",
    "log":
    ↪ "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-c
    ↪ ode-20260906/bariatric-surgery/logs/r03-host-run_tests-a01.log",
    "created_at": "2026-09-06T11:37:41.835332+00:00",
    "status": "finished",
    "pid": 2413739,
    "start_ticks": "83273675",
    "state": "R",
    "started_at": "2026-09-06T11:37:41.842852+00:00",
    "returncode": 0,
    "completed_at": "2026-09-06T11:41:39.911835+00:00"
  }
],
"completed_at": "2026-09-06T11:41:39.925004+00:00",
"scope": "Structural coverage, syntax and synthetic execution; not
↪ scientific validation."
},
"reviews": {
  "opus": {
    "status": "complete",
    "verdict": "revise",
    "report": "/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-referen
    ↪ ce-code-20260906/bariatric-surgery/reviews/r03/opus.yaml"
  },
  "codex": {
    "status": "failed",
    "verdict": null,
    "error": "FileNotFoundError: [Errno 2] No such file or directory:
    ↪ '/home/shaoerzhuo/Bolero-denmark/.prereg-runs/denmark-reference-cod
    ↪ e-20260906/bariatric-surgery/reviews/r03/codex.yaml'"
  }
},
"review_status": "incomplete",

```

```

    "revision_slots_used": 2,
    "continuation": "package_current_draft_with_unresolved_findings"
}

```

r01 / codex.md

Codex independent adversarial reference-code review — round 1

Outcome

Verdict: revise. The World contains real construction and analysis code for every supported Atom, not wrappers that merely announce missing inputs. The advertised synthetic suite completed all 26 tests with zero failures or errors, and every one of the nine direct Atom entries produced a nonterminal synthetic result. The implementation also correctly refuses to invent a causal estimator: the frozen I1-I3 identification audit makes every causal target `not_identified`, so an RD, DiD, matching, hazard model, or other numerically runnable substitute would be source-unfaithful.

Independent edge cases nevertheless found seven executable defects, and inspection of an actual bound figure found an eighth presentation defect. These require narrow engineering fixes; they do not call for new experiments or a change to the frozen protocol. No real data or old empirical session was used, and no result below is an observed scientific finding.

Per-Atom coverage

Atom	What I verified	Review result
atom-000001	Documentary predicate audit, all result regions, unidentified causal-target interface, Figure 1 binding	Substantive implementation. The causal stop is faithful. Actual Figure 1 is about 398.8 mm high and cannot fit a conventional manuscript page at its registered 130.7 mm width (CODEX-R01-008).

Atom	What I verified	Review result
atom-000002	H construction, age/enrollment separation, residence and record-key checks, frozen R, flow/denominator/baseline files, downstream cohort handoff	Substantive implementation and advertised boundary tests pass. The downstream handoff has no trusted producer/derivation root: a forged <code>historical_ready</code> result and arbitrary H activate consumers (CODEX-R01-002).
atom-000003	Public/private/LPR3 operation construction, stable and cumulative outputs, optional strata, capture/financing/prior-surgery branches, failure salvage	Substantive implementation. Same-day exit ordering is wrong (CODEX-R01-003); overlapping source intervals can hide a private gap (CODEX-R01-004); and injected operational salvage omits explicit statuses for later unrun components (CODEX-R01-007).
atom-000004	Inpatient episodes, acute all/CV principal series, registered sensitivities, carry-in contact behavior	Substantive implementation; advertised transfer/episode tests pass. Shared domestic filtering drops a valid death-day event on a death/emigration tie (CODEX-R01-003).

Atom	What I verified	Review result
atom-000005	Local F construction, diabetes event typing and cumulative subdistribution, supplements and competitors	Substantive implementation. A pre-1996 DE11 record, outside both F history and follow-up, suppresses a valid 2010 event because deduplication occurs before the outcome clock (CODEX-R01-005). Shared exit-tie defect also applies (CODEX-R01-003).
atom-000006	Local T, drug months/classes, hospital T2 episodes, duration/no-dispensing branches	Substantive implementation. Complete LMDB coverage with zero A10 rows crashes the no-dispensing branch (CODEX-R01-006); the shared exit-tie defect also applies (CODEX-R01-003).
atom-000007	Psychiatric contacts, self-harm/alcohol events, drug classes, sensitivities and source-silent baseline boundary	Substantive implementation and independent source gaps stay local. Shared domestic filtering violates the registered tie order (CODEX-R01-003).
atom-000008	Independent vital construction, cumulative death/emigration, annual first-death increments, zero-event behavior	Substantive principal construction. Complete zero-death data builds the 18 zero cumulative ALL points and then crashes annual increments with <code>KeyError: 'pid'</code> , contrary to the explicit zero-death rule (CODEX-R01-006).

Atom	What I verified	Review result
atom-000009	Population and operation clocks, index-stay/repeat/late-condition components, fixed-window figure interface	Substantive implementation. It inherits the tie defect and chooses the private union from linkage metadata alone, losing an independently valid public operation stream when private capture is absent (CODEX-R01-003/004).

All execution entry points share CODEX-R01-001: implementation hashes are recorded but never checked against a trusted reference. All downstream consumers of Atom 2 share CODEX-R01-002.

Independent executable cases

The complete reviewer harness is [counterexamples.py](#). It operates only on copied execution code and newly generated synthetic fixtures. Its machine-readable results are [counterexample-results.json](#).

Running it with the controller Python reproduced:

1. A valid healthcare event on a death/emigration tie day was discarded, although D3 orders care, then death, then emigration.
2. Removing the whole 2008 completeness interval from PRIV_SKSOPR still allowed a `public_and_private_recorded` union check for 2008.
3. With evidenced absent private tables, the public 2008 operation stream passed while Atom 9's selected union was blocked.
4. Adding a 1995 DE11 to a person who remained in F changed the 2024 T2 numerator from 38 to 37 despite an unchanged valid 2010 DE11.
5. Complete pharmacy delivery with zero A10 rows raised `AttributeError: 'DataFrame' object has no attribute 'pid'`.
6. Complete DOD delivery with zero deaths built 18 valid zero cumulative points, then annual increments raised `KeyError: 'pid'`.
7. A self-hashed dummy Atom 2 output and H containing `FORGED_NOT_IN_DELIVERY` activated and ran Atom 8.
8. A copied implementation with a changed bootstrap seed ran successfully; its different hash was only reported, not rejected.

The advertised `run_tests.py` suite remains useful evidence for broad paths: all 26 tests passed in 118.808 seconds, all nine Atoms ran, readonly/relocated paths and realized-body identity behavior were exercised, and all seven figures rendered. It is not an independent oracle for the failed branches. In particular, its death/emigration tie assertion encodes the same contradictory output as the implementation, its

operational-failure test checks only preserved stable results and `financing.csv`, and it has no complete zero-death or zero-A10 case.

Source-fidelity findings and required regressions

CODEX-R01-001 — high: execution code is not authenticated

`contracts.py:81-96` checks protocol/material digests, and `run.py:178` records hashes of whichever Python files are running. The trusted file map at `frozen-identity.json:14-92` does not include the execution sources, and there is no comparison step. The altered-seed copied CLI therefore returned zero. Bind scientific executable hashes to the immutable World reference or a controller-held attestation before imports/execution. This check must remain separate from Atom/Molecule registration identity so legitimate realization-body edits keep passing. Regression: exact relocated copy passes; a one-byte change in each executable-source class fails before output.

CODEX-R01-002 — high: predecessor/H provenance is circular

`run.py:32-60` accepts hashes asserted by the predecessor status itself; `run.py:62-75` similarly accepts the status-asserted H hash after shallow shape checks. No trusted producer or D2 derivation is proven. Require a trusted output-manifest attestation and expected per-Atom schema, and either recompute H from the already bound D2 inputs or verify a trusted derivation attestation. Regression: a validly hashed dummy aggregate and delivery-extraneous PID cannot activate or load.

CODEX-R01-003 — high: three-way date tie violates D3

`data-contract.md:33` says a valid death-day healthcare event counts before death, and death precedes same-day emigration. `construction.py:311-312` excludes every event where `t >= emigration`, explicitly including the tie. Resolve the operative first exit before filtering and add separate death-day, emigration-day, and death/emigration/event tie tests.

CODEX-R01-004 — high: private completeness and sibling fallback

`construction.py:429-432` correctly intersects tables within a source, then incorrectly extends all source intervals into one OR-coverage list. In a public/private union, overlapping required sources need source-specific completeness. `safety.py:13-17` separately selects that union based only on `same_PNR`. Preserve explicit incomplete-union rows and consistently labeled public-only siblings in Atoms 3 and 9. Regression: a one-year private gap and wholly absent private tables must not be labeled complete union and must not erase valid public output.

CODEX-R01-005 — high: incident-diabetes time zero

`analyses.py:320-338` receives pre-entry contacts, sorts all candidate diabetes records, and drops to the first PID record before downstream rate construction applies

entry. Restrict outcome candidates to entry or later before first-event ordering. Keep baseline F history separate. Test pre-1996, baseline-window, entry-day, later, and same-day competing records.

CODEX-R01-006 — high: empty event frames

The empty-mask expressions at `analyses.py:422` and `analyses.py:484` are interpreted by pandas as column selection because the empty mapped mask has non-bool dtype. Use explicit boolean `.loc` masks and stable declared columns. Run complete header-only/zero-event deliveries through the full Atom 6 and 8 CLIs, checking zero points, registered interval status, all component rows, and no operational terminal.

CODEX-R01-007 — medium: component-granular failure truthfulness

`run.py:229–255` preserves rows accumulated before an unexpected exception but adds only `uncompleted_registered_work`. The existing financing injection occurs before private capture, prior surgery and common-exit outputs, none of which receives its required `no_result` row. Define an exact registered component inventory and materialize missing keyed rows/grids on salvage. Extend the injection assertion to the whole inventory.

CODEX-R01-008 — low: Figure 1 physical interface

`_support.py:243` grows the audit canvas without a physical-height limit. The actual adapted PDF is 370.488 by 1130.4 points on one page. Preserve every predicate and implication but paginate or use a bounded layout, then assert a manuscript-compatible maximum page height and compile the paper binding.

Integrity, outputs, and limitations

`sha256sum -c prereg/CHECKSUMS.sha256` reported all 90 immutable-original entries OK. `diff -qr` between `.controller/source` and the World reported only the added `prereg/engineering` and `prereg/execution` directories; no original source file differed. The paper result map and figure inputs point to actual reference-code outputs. Adapted Figures 3 and 7 were visually legible; the adapter repaired observed right-edge clipping in original Figure 3. Detailed pixel-level review of Figures 2, 4, 5 and 6 was not performed.

The following are faithful unresolved boundaries, not demands for new science: absent normalized brief/data-boundary/institutional/search ledgers; source-silent baseline-history windows and exact safety code sets; raw LMDB reconciliation; private/provider/payer/vintage label evidence; and date-only emigration timing. The production Helvetica files were unavailable. No governed real-data manifest, register rows, disclosure approval, production-scale run, R/Stata engine, QGPU, or live source refresh was used. Consequently every numerical value in the test artifacts is synthetic; all empirical manuscript cells remain unavailable, and all frozen causal targets remain blank and `not_identified`.

Commands and observed results

The authoritative command inventory, including the expected relative-output CLI rejection and the initially misspelled standalone import, is in [codex.yaml](#). The principal commands were:

```
OPENBLAS_NUM_THREADS=1 OMP_NUM_THREADS=1 PYTHONDONTWRITEBYTECODE=1 /home/shao |
↪ erzhuo/anaconda3/bin/python <World>/prereg/execution/run_tests.py --world
↪ <World> --output <absolute scratch>/advertised-suite
# PASS: 26 tests, 0 failures, 0 errors

OPENBLAS_NUM_THREADS=1 OMP_NUM_THREADS=1 PYTHONDONTWRITEBYTECODE=1
↪ /home/shaoerzhuo/anaconda3/bin/python <scratch>/counterexamples.py
# PASS as a harness: eight defect assertions reproduced

sha256sum -c prereg/CHECKSUMS.sha256
# PASS: all 90 listed files OK

pdfinfo advertised-suite/figures/adapted/figure1.pdf
# one page; 370.488 x 1130.4 points
```

This `revise` verdict is limited to reference-code fidelity and testability. It is not scientific acceptance, evidence that the intended intervention is identified, or approval to fill any result cell.

r01 / opus.md

Independent adversarial reference-code review — Opus, round 1

Verdict: revise. Three narrow but real defects (F1–F3) plus two low-severity items (F4–F5). Everything else I could test is faithful. Nothing here asks for a new research question, a new analysis, an extra Atom, or any change to the frozen protocol.

What this review is not. It is not scientific acceptance of the user-frozen registration, not replication, and not approval of the original design. The entire registered causal programme is *unavailable by design* — `identification.md` I1–I3 forbid a causal estimator and `atom-000001` adjudicates `not_identified`. I verified that the bundle contains no DiD, staggered-adoption, RD/difference-in-discontinuities, IV/Wald, matching, weighting or survival estimator anywhere, and that every `causal-targets.csv` row is blank with `mode=causal_target_unidentified`. That absence is fidelity, not a gap. Separately: **no real Danish register data exists in this environment, so every empirical result for all nine Atoms remains unavailable.** Nothing below supplies a study number.

Reviewed snapshot: `v001/world.diff -rq .controller/source v001/world` shows the World is byte-identical to the immutable source apart from the two added directories `prereg/execution/` and `prereg/engineering/`. No Atom protocol, Molecule registration, shared contract, manifest, `CHECKSUMS.sha256` or figure template was modified to make the code pass.

1. Per-Atom coverage

Every Atom has a real implementation, not a wrapper. All nine executed end-to-end through the copied-layout CLI against a **mutated, read-only** World copy (scratch/r01/opus/roworld, whose atom-000004 atom_result/body and Molecule current-interpretation text I edited first), writing to an external results root:

Atom	Implementation reached	Synthetic state	What I checked beyond the author's suite
atom-000001	audit.identification / causal_targets	not identified	38 real predicate rows with source URLs, document dates and I2/I3 locators; January/July 2011 conflict retained; three regions and grandfathering unresolved; absent institutional-ledger.yaml / search-and-screening.yaml / normalized brief recorded, not fabricated; blank causal targets; figure1 renders
atom-000002	Construction.cohorts.run.cohort_tables	is populated	residence 2011-01 boundary arithmetic (2011-y-((1,1)<(m,d))) is exact; DE660D window 2005-2006 and R window 2003-2006 correct; residence anchors; private H.csv. F3 found here

Atom	Implementation reached	Synthetic state	What I checked beyond the author's suite
atom-000003	Analysis.access/ operation stream/ financials	operation stream/ financials	Financing LPR3 pathway person resolution; public/private surgery-day dedup; introduced-code windows never become historical zeros; financing stops at unresolved payer
atom-000004	Analysis.hospital/ episode stream, construction.episodes	episode stream,	Independent D3 episode oracle: exact numerator match for all 18 years, R0 and ALL. Hand-computed 2007 R0 rate matches to full precision
atom-000005	Analysis.incident/ patient es, Construction.strata/drugs	patient es,	Competing-event priority on same-day ties; DO244 gestational continuation; F negative history.
atom-000006	Analysis.treatment/ drug months	drug months	F2 found here Month indicators not fill counts; A10A/A10B split; units never pooled; hospital arm survives LMDB loss

Atom	Implementation reached	Synthetic state	What I checked beyond the author's suite
atom-000007	<code>Analysis.psychiatric_contact_events</code>	<code>partial</code>	Contact starts, not visits; self-harm restricted to a narrower coded subset unless external-cause capture is complete; PSYK loss leaves somatic self-harm
atom-000008	<code>Analysis.mortality_vital_events</code> , <code>Construction.vital</code>	<code>partial</code>	Independent cumulative-mortality oracle: exact match. Fixed original denominators, no immortal time, emigrant-then-death not a domestic death.
atom-000009	<code>safety.execute_safety</code>	<code>partial</code>	F1 visible here Independent 0–30 window oracle: exact match. Operation-cohort denominator proven distinct from H; exactly eight figure rows; day-zero repeat kept status-only

`partial` on the fixture is correct, not a shortfall: it is driven by the *registered* zero-event/degenerate-bootstrap guard (`interval_unavailable`, e.g. 102 of 108 `atom-000008` annual rows have no events before 2024) and by introduced-code windows.

2. Findings requiring a fix

F1 (medium, confirmed) — the registered same-day death/emigration tie is resolved the wrong way

data-contract.md D3: “count a valid hospital/procedure event dated on a death day before death; **death precedes emigration on the same day**; exclude healthcare events on an emigration day ...”.

construction.py:312 applies the emigration-day exclusion **before** the death-day rule at line 313, so for a person whose DOD and first VNDS emigration fall on the same date the death-day event is dropped. Three sites disagree with each other:

```
opus_probe1.py
A. domestic() retained events per person: {'deathonly': 2, 'tie': 1}
   expected under D3 death-first tie: {'deathonly': 2, 'tie': 2}
B. exit_events('death') pids: ['deathonly', 'tie']
   exit_events('emigration') pids: []
C. alive_resident_days(tie) = 366
C. alive_resident_days(deathonly) = 367
```

analyses.py:145 already classifies the tie person as a **death** — so by the code’s own exit logic that person never emigrated and the line-312 exclusion is unreachable. The same ordering appears at `safety.py:141-143`, and `common_exits` (`analyses.py:170-171`) also truncates observation at `emigration - 1` day, costing the tie person one observed day.

The author’s disclosed boundary “*Healthcare before emigration on the same calendar date — D3 exception requires verified departure-time order*” does **not** cover this: it concerns the time-stamped exception to D3’s third clause, whereas D3 resolves the death/emigration tie date-only.

Fix — minimal patch, one line per site. Compute `exit_is_death = death is not None and (em is None or death <= em)` once, and **leave line 308 untouched**: that branch both *logs* the D3 “healthcare record after domestic death” contradiction and drops, and the logging is exactly what produces the verified behaviour in §3 (affected windows `data_gap` with the exact reason while 2007 stays available). Merging the branches into one predicate would regress it. Change only line 312 to `if not exit_is_death and em is not None and t >= em: continue`; suppress the `emigration - timedelta(days=1)` term in `common_exits` when `exit_is_death`; and reorder `safety.py:141-143` so the death check precedes the emigration-day exclusion when the exit is death.

Regression test — important. `run_tests.py:142` currently *pins the defect* (`{"d": 2, "e": 1, "t": 1}`). The corrected code will fail the author’s own suite unless that assertion is changed to `{"d": 2, "e": 1, "t": 2}`, with an added assertion that the tie person and the death-only person receive identical `alive_resident_days`.

F2 (medium, confirmed) — an unregistered pre-entry lookback deletes registered post-entry T2 events

atom-000005: “The principal metric *t2_cumulative* is first recorded DE11*/DO241* after entry”. D2 freezes F’s negative history at 1996–2006.

`analyses.py:320` reads contacts with `retain_preentry=True`, and lines 334–338 take each person’s **globally first** diabetes record via `drop_duplicates("pid")`; `estimation.count_values` then discards it because it precedes ENTRY. The person keeps their place in F’s denominator, their genuine post-entry event never counts, and the competing partition records them as `no_record` rather than as a competing event — a missing-evidence-to-zero substitution that D5/I4 forbid.

Reachable whenever the delivered hospital era reaches before 1996, which D1 documents (LPR_ADM/DIAG 1977–2019). Pre-empting the obvious objection — “an operator would never declare a pre-1996 era” — `hospital_eras` is a **single global source-lineage setting**, also used for 2007–2024 follow-up, not a per-analysis look-back window; declaring the true delivered lineage triggers this, and the delivered `complete_intervals` stay 1996+ either way.

```
opus_probe2.py    (hospital_eras from 1977-01-01; complete_intervals unchanged
↳ at 1996+)
baseline (no pre-1996 record): stratum(SYNTHETIC_01_O_F)=F F_N=64
↳ t2_cumulative(2024,ALL) numerator=38
with 1994-06-01 DE11 record: stratum(SYNTHETIC_01_O_F)=F F_N=64
↳ t2_cumulative(2024,ALL) numerator=37
```

The person is still (correctly) in F, the denominator is unchanged, and their registered 2010-03-01 DE11 event has silently vanished from the principal endpoint.

Fix. Restrict the event frame to `date >= contracts.ENTRY` before the per-person first-event selection in `Analysis.incident_diabetes` (same for the **other** competitor stream), so the implemented estimand and the frozen F window agree. **Regression test.** The fixture above, asserting the numerator stays 38 and F_N stays 64.

F3 (medium, confirmed) — one date-invalid SKS subtype code aborts the whole cohort

`Construction.coded` (`construction.py:66–70`) raises a `Boundary` when a selected code is absent from the frozen `study-sks.csv` or invalid on the event date. That `Boundary` is caught **per record** at five call sites (`analyses.py:98, 110, 121, 333, safety.py:44`) but is **unhandled** in `cohort()` (lines 248–250) and `strata()` (355–358).

The likeliest real trigger is the *absent-code* case, which the author’s own README already concedes (“Required codes missing from that extract remain unresolved”): real SKS diagnosis granularity far exceeds the extract’s 1 803 codes, so a delivered DE11- or DI1x-family subcode outside it is more probable than a miscoded date — and there `coded()` raises the **default data_gap**, reporting an unevidenced unknown as an evidenced boundary, against its own README and D5. Date-invalidity is the second, directly demonstrable trigger:

```
opus_probe3.py
atom-000002 with ONE date-invalid DE282C record: data_gap | D3: selected SKS
↳ code absent or invalid on event date
  cohort-flow.csv collapses to a single status row
atom-000004 (activation_respecting, no predecessor): not_activated
strata() with ONE date-invalid D0244A record -> Boundary: data_gap
atom-000005: data_gap    atom-000006: data_gap
```

D2 says an invalid subtype code “*flags a component, not silent reassignment*”, and atom-000002’s registered `data_gap` region is limited to a verified absent core field, label mapping, residence reconstruction or core-key contradiction. One person’s bad diagnosis row is none of those, yet it stops all nine Atoms.

Reachable code/window pairs actually present in the frozen extract: **DE119A** (valid from 2003-10-01), **DE282C** (2004-01-01), **DG4730/4731/4735/4739** (2006-04-01), **DI119A/DI129A** (2012-01-01) inside R’s 2003–2006 window; **DO244A** (ends 2001-12-31), **DE109A**, **DO245** inside the 1996–2006 diabetes-history window. It also fires for any delivered code absent from the 1 803-code extract. Note the second-order issue: for an *absent* code the README says it “remains unresolved”, but the raised status is `data_gap` — an unevidenced unknown reported as an evidenced boundary.

Scope bound (verified). *H membership itself is never at risk.* DE660D is selected with `exact=True` (the literal code only, no descendants) and its frozen validity 2003-04-01...2010-03-31 fully covers D2’s entire 2005-01-01...2006-12-31 selection window. So exactly two sites need fixing, and each has an obvious registered disposition: in `cohort()` the person stays in H and the ALL descriptions stay valid while the R-dependent group rows and contrasts carry an explicit status (D2 step 4’s “retain ALL”); in `strata()` an unresolvable code means the negative history cannot be *verified*, so that person falls to U with a logged reason while F/T stay valid for everyone else.

Fix. Catch the Boundary per record in `cohort()/strata()` exactly as the five existing sites do, applying those dispositions: log the record, and use `unresolved` when the code is absent from `study-sks.csv`, `data_gap` when it is present but invalid on the event date. Do not abort the registered construction. **Regression tests.** Both fixtures above, asserting H is still built, atom-000002 stays `historical_ready`, the affected component carries an explicit status row, and atom-000006’s `t2_inpatient` still estimates when only an obstetric code is unresolvable.

F4 (low, confirmed) — an otherwise predecessor is reported downstream as `data_gap`

`run.py:204-205` maps both `data_gap` and `otherwise` H predecessors to one Boundary whose default status is `data_gap`. Refusing to bypass is right; the label is not. `opus_probe7b.py`: an `otherwise` predecessor yields atom-000008 `local_state=data_gap`. D5 allows `data_gap` “*only when the absence is evidenced*”, and the Molecule then narrates the evidenced-boundary rule instead of the unresolved one.

Why this and not the similar-looking item I dropped. I deliberately did **not** report `contracts.unavailable()`'s mapping of `unresolved` onto row status `data_gap`: D4's row-status vocabulary is closed and has no `unresolved` slot, so that is a forced encoding choice, and the distinction survives end to end because the `STOP_UNRESOLVED_SOURCE` reason routes to `local_state: otherwise` at `run.py:222` and `estimation.py:138` (the author's `test_20/test_24`, which I re-ran). `run.py:205` is different: there the code already holds the literal registered key `"otherwise"` and discards it, and the *Atom-level* state vocabulary does contain `otherwise`.

Fix. Raise `Boundary(..., "unresolved")` when the predecessor state is `otherwise`.

F5 (low, confirmed) — failed components are not individually marked `no_result`

Injecting `RuntimeError` into the mandatory `Analysis.common_exits` step of `atom-000004` correctly yields `partial`, retained principal contrasts, `diagnostics.failure_type` and one `uncompleted_registered_work no_result` row — but the registered `death_competitor`, `emigration_competitor` and `alive_resident_days` rows are absent from `components.csv` entirely, where the protocol says to “*mark each failed component no_result*”. **Fix.** Emit an explicit `no_result` row per unfinished registered component group.

Cost of the fix round

F2's `date >= ENTRY` filter and F3's per-record catch are **no-ops under the author's default fixture** (`hospital_eras` start 1996-01-01; no delivered code is out of validity or absent from the extract), so all 26 existing test groups keep passing unchanged. F4 and F5 only add or relabel dispositions on paths the current fixture does not reach. **F1 is the only fix that requires editing an existing author assertion** (`run_tests.py:142`). The round should be cheap and cause no suite churn.

3. What I verified as correct (independent, not author-confirmed)

Estimator and inferential fidelity. There is no model to be rank-deficient here: the registered design is a finite-source descriptive program with a municipality cluster percentile bootstrap and no nuisance fits, so RD bandwidth/kernel, modern staggered-DiD weights, matching and clustered SEs are inapplicable by registration — and, correctly, absent. The I5 bootstrap is implemented exactly: 9 999 draws, seed 20260905, NumPy PCG64, `np.bincount(rng.integers(0,M,M))` cluster multiplicities, linear quantiles at `.025/.975`, group denominators recomputed per draw. The author's `test_06` is a genuine independent oracle (it re-copies sampled person histories in plain Python and compares all 9 999 draws at `rtol=1e-13`); I re-ran it rather than re-deriving it. The <30 contributing municipalities, >1% undefined replicate and

zero-event/degenerate guards are all registered (I5; atom-000004 step 4; atom-000008 step 4) and all fire.

Independent numeric oracles I wrote. Re-implementing D3’s acute-episode rule straight from the fixture CSVs (overlap/next-day spell merge, count once at the first acute admission, domestic filter) reproduces atom-000004’s numerators exactly for **all 18 years**, for both R0 and ALL — 0 years differing. Hand-computed 2007 R0: $1000 \times 148 / (64 \times 365/365.25) = 2314.083904109589$, identical to the emitted estimate and `person_years` = 63.95619438740589. `death_cumulative` 2024 (32/16/16 of 128/64/64) and the `R0_minus_R1_cumulative` contrast match. The safety 0–30 `potential_complication` window (84 persons / 128-person operation cohort = 656.2500 per 1000 operations) matches, with the index-stay flag mapped to day zero exactly as the frozen figure interface requires.

Cohorts, clocks and leakage. Age is taken at 2011-01-01 from birth date and is distinct from the 2007 enrolment; the index-selection date (contact start) is distinct from the operation date, from the first acute admission and from the first-operation clock. A carry-in December-2006 admission transferred into January 2007 stays one 2006 episode. A person dying in 2008 remains in the fixed 2024 denominator and numerator; an emigrant who later dies abroad is not a domestic death; a deliberately contradictory post-death healthcare record blocks only the affected windows (2007 stays `available`) with the exact D3 reason and state `partial`. Original denominators are never replaced by survivor person-time. Duplicate child joins, contactless pathway procedures, same-day public/private reports and repeated pharmacy fills are all deduplicated as registered.

Safety denominators (my own test, since the author’s test_16 cannot distinguish them — every fixture person has an operation). Removing operations for half the fixture gives conditional `denominator_n` = 64 (operation cohort) against `annual.csv` `denominator_n` = 128 (H), and the shrunk municipality support correctly produces `interval_unavailable` with the registered I5 reason rather than a forced direction. All eight figure rows persist.

Result-state discipline. Exhaustive enumeration of `adjudicate()` over every principal sign combination plus the `unavailable/unresolved/no_result` paths yields *exactly* each Atom’s registered verdict key set for atom-000003–atom-000009; `discordant` is reachable only for the four Atoms that register it. `insignificant/equivalence` states do not exist.

Dispatch and evidence integrity. Direct dispatch bypasses only outer activation. A `no_result` predecessor is not retried; `data_gap/otherwise` predecessors block downstream analysis *even under --dispatch-policy direct*. Six forged predecessors were rejected: missing output evidence, unknown result region, simultaneous scientific + operational state, unsupported terminal, wrong registration identity, wrong core cohort binding — plus a post-hoc edit to a referenced output file. Unactivated runs give `activation value` = `None` (Strong Kleene unknown, not false) and still emit the full planned grids: 108 annual rows and all eight atom-000009 figure rows with blank numerics and `status=not_activated`; `figure7` renders from that file and prints the reason instead of inventing a point.

Registration identity. `verify_world` accepts a relocated read-only World whose `atom-000004 atom_result` and `body` and whose Molecule current-interpretation text were edited, and rejects an edited Atom preregistration question, an edited `prereg/data-contract.md`, and an edited Molecule membership role. Output-inside-World, private-inside-World, overlapping private/aggregate roots and re-running into a nonempty Atom directory are all rejected. Nine CLI runs left **zero** `__pycache__` directories in the World.

Disclosure. Governed-unapproved publishes only **suppressed** rows with blank numerics while retaining `local_state` privately; supplying `approved_payload_sha256` equal to the computed payload releases the identical numbers; a wrong hash stays suppressed; a synthetic dictionary cannot authorize a governed origin.

Schema provenance. All 23 documents in `engineering/schema-document-checks.json` re-hashed independently against the repository resources *and* against the frozen `schema-ledger.yaml`: 23/23 match.

Figures. All seven templates render from actual generated aggregate files through the advertised `render_figures.py` CLI at exactly **130.700 mm** with zero glyphs outside the page. `figure7` filters on `metric=window_first_event`, so the `window_recurrent_events` rows sharing the same component/period labels cannot double-plot; `figure4` uses two separate axes, as `atom-000008` requires. I inspected `figure3`, `figure4` and `figure7` at manuscript width: legible, per-panel units, exact nonavailable reasons printed.

4. Two bonus positives on the figure interface (no code change requested)

1. **The production font binding works.** The author's scoped claim that Helvetica Neue was unavailable is reasonable — this run's `.prereg-inputs` directory supplies no `runtime-style` bundle, which I confirmed. But usable copies of the four TTFs exist elsewhere in the repository, at `.prereg-inputs/techbridge-frontier-20260905/runtime-style/fonts/` (another study's non-confidential stage inputs). Rendering all seven figures with `--style-dir` pointed there succeeds: each PDF embeds `HelveticaNeue` only, at 130.700 mm, with zero glyphs outside the page. The `--style-dir` binding is therefore **verified**; only the runtime's own font supply remains unknown, which shortens the untested list.
2. **The note clipping is font-dependent — a note for the runtime, not a shortfall.** The unadapted frozen templates clip only under the local DejaVu Sans fallback (`figure1` 6 glyphs, `figure3` 1, `figure5` 1, `figure6` 2 crossing the page edge). With production Helvetica Neue metrics **none** of the seven clips, so `render_figures.py`'s disclosed 75 % rewrap — applied unconditionally — narrows note text that needs no repair in production. The adapter is meaning-preserving and logged, so I request no change.

5. Source gaps I checked and accept

Each disclosed source-silent gap is genuine and narrowly scoped, stopped at a named runtime input rather than defaulted: pre-2007 contact-count lookback, baseline psychiatric history, baseline nutrition/hypoglycaemia history, band-removal and mesenteric-defect exact code sets, LMDb finalized-transaction semantics, payer meanings, external-cause self-harm completeness, LPR2/LPR3 semantic continuity, and the D3 time-stamped emigration-day exception. Absent resolution they stop with `STOP_UNRESOLVED_SOURCE` and do **not** block H or the principal endpoints. `atom-000001` correctly records that `institutional-ledger.yaml`, `search-and-screening.yaml`, the normalized brief and the original `inputs/data-boundary.yaml` are absent from the supplied World (I confirmed all four) without fabricating replacements.

Two brief-item checks that produced no finding. *“Untouched executable siblings retained”*: there were none to retain — the World contains no `prereg/code/` and no `prereg/replication/`, and `diff -rq` confirms no pre-existing analysis code existed before this round, so nothing was displaced, deleted or rewritten. *“Source-author code disagreements”*: not applicable — this is the ordinary adaptive lane, not a replica, so there is no source paper, no published comparison target and no original author code to disagree with; the frozen Atom/Molecule registration is the sole authority, and that is what I audited the code against.

Two structural notes, neither a defect: no Atom protocol references `prereg/execution/` because satisfying that predata-engineering instruction would require editing frozen registration payloads — the author correctly left them untouched; and `prereg/execution` and `prereg/engineering` are not covered by `manifest.yaml/CHECKSUMS.sha256` (0 of 89 lines), which the author discloses as a deliberate non-reseal.

6. What remains unavailable

All nine Atoms’ empirical results. There is no governed mount, no provider dictionary, no delivery calendar, no disclosure approval and no confidential row anywhere in this environment, and the intended policy ITT is unidentified by registration in any case. Every number in this review is synthetic-fixture engineering evidence. Full-scale performance, real LPR2/LPR3 label semantics and this runtime’s own font supply are untested. Python 3.12.4 / NumPy 1.26.4 / pandas 2.2.3 / SciPy 1.15.2 / PyYAML 6.0.2 / Matplotlib 3.10.0 / PyMuPDF 1.24.9 all present and matching `requirements-tested.txt`; no R or Stata engine is required by this design and none was substituted; no shared environment was changed.

All proof artifacts stay in `scratch/r01/opus/`. Nothing was written into the World, the immutable source, controller files, repository resources or another reviewer’s outputs, and I did not read the other round-1 reviewer.

Round-2 independent engineering review — Opus

Verdict: revise. Four narrow, reproduced defects, each with a one-place fix and a regression test. This is an engineering/source-fidelity judgment only. It is not scientific acceptance of the user-frozen registration, not replication, not approval of the original protocol, and it contains no observed study result. Every number below comes from clearly labelled synthetic fixtures held outside the World.

I did not read the other round-2 reviewer. I did read both round-1 reviews and the author's response table in `prereg/engineering/implementation-report.md`, and I treated the round-1 fixes as claims to be attacked rather than as settled.

1. What changed since round 1, and how I tested it

`diff -rq v001/world v002/world` shows the author touched only `prereg/engineering/{implementation-report.md,validation-summary.json}` and `prereg/execution/{README.md,analyses.py,construction.py,contracts.py,estimation.py,render_figures.py,run.py,run_tests.py,safety.py}`, adding `inventory.py` and `source-manifest.json`. `diff -rq .controller/source v002/world` confirms no original Atom, Molecule, contract, manifest, checksum or figure template byte moved, and `sha256sum -c prereg/CHECKSUMS.sha256` passes for all 89 sealed files.

I copied the execution directory into a writable action workspace, copied the World into a separate relocated (and, for the portability test, read-only) path, and re-ran the advertised suite myself: **39 groups, 0 failures, 0 errors, 0 skips, 236.971 s**, matching the host stage's independent run (39 groups, 249.607 s). I then wrote my own counterexamples rather than relying on the author's assertions — the author changed several of their own expected values this round, so a passing suite is not independent support for the changed lines.

2. Round-1 fixes I attacked and could not break

Round-1 item	My independent check	Outcome
Opus F1 / CODEX-003 same-day death/emigration	<code>opus_probeD_tie.py</code> : three-person fixture (death-only, tie, emigration-only), each with admissions on 2008- 01-01/02/03, compared against a D3 oracle I wrote from the contract text, not from the code	FIXED. Kept sets match exactly; tie and death-only both retain the death-day admission and 367 alive-resident days in 2007–2008; emigration-only keeps 366

Round-1 item	My independent check	Outcome
Opus F2 / CODEX-005 pre-entry diabetes	<code>opus_probe0_t2.py</code> : 1977 hospital lineage + a 1994 DE11 for an F member; a 1996–2006 DE11; an entry-day 2007-01-01 event; a same-day DE10/DE11	FIXED. 38/64 invariant; the 1996–2006 record correctly removes the person from F (37/63); the entry-day event lands in 2007; the same-day tie becomes the uncertain competitor (t2 38→37, other 14→15)
Opus F5 / CODEX-007 component salvage	<code>opus_probeS_fail.py</code> : RuntimeError injected inside <code>Analysis.drug_months</code> (Atom 7) and inside the late safety components (Atom 9) — sites the author’s tests do not use	FIXED. <code>local_state=partial</code> , completed siblings retained (self_harm fully available, psych_starts retained with estimates), every registered component present with an explicit status, all eight Atom-9 figure rows present
CODEX-001 unauthenticated copied code	<code>opus_probeJ_auth.py</code> : changed the registered bootstrap seed 20260905→20260906 in a copied action, with and without a forged action-local <code>source-manifest.json</code> ; added an extra module; edited <code>frozen-identity.json</code>	FIXED. Each rejected before scientific imports, exit 2, no output written. Exact copy runs. A <code>README.md</code> change (not scientific code) is allowed, which is correct
CODEX-004 private-coverage masking	<code>opus_probeR_union.py</code> : removed 2008 from <code>PRIV_SKSOPR.complete_intervals</code> only, leaving <code>PRIV_ADM</code> and the public source complete	FIXED. <code>capture.csv</code> union/2008 is <code>data_gap</code> interval; PRIV operation source calendar incomplete”; the principal series and Atom 9’s anchors use a consistently labelled <code>public_recorded</code> scope for all years

Round-1 item	My independent check	Outcome
CODEX-006 empty-frame crashes	<code>opus_probeK_zero.py</code> : my own complete zero-event deliveries — header-only PSYK, header-only LPR_SKSOPR/PRIV_SKSOPR, and a delivery with every DX self-harm code stripped	FIXED and extended. Zero points with <code>interval_unavailable</code> , complete grids, no operational terminal. With no operations at all Atom 9 emits exactly its eight registered rows as <code>data_gap</code> “verified empty first-operation cohort” — no fabricated operation-clock point
Opus F4 otherwise-predecessor label	Read <code>run.py</code> :312-314 plus the author’s test 34 in my own run	FIXED. <code>otherwise</code> → <code>Boundary(..., "unresolved")</code> → <code>local_state=otherwise</code> ; <code>data_gap</code> → <code>data_gap</code> ; the default policy still reports <code>not_activated</code>
CODEX-002 self-authored predecessor	<code>opus_probeF_pred.py</code>	FIXED as stated, but the repair over-reaches — see OP-R2-3
Opus F3 whole-cohort abort	<code>opus_probeA_R.py</code> , <code>opus_probeE_strata.py</code>	FIXED as an abort (H survives), but the replacement is over-conservative — see OP-R2-1 and OP-R2-2
CODEX-008 over-height Figure 1	<code>opus_probeH_figs.py</code> + a real <code>pdflatex</code> build with the unmodified frozen shell	PARTLY fixed; the content no longer reaches the manuscript — see OP-R2-4

3. The four blocking defects

OP-R2-1 (high) — a known $R=1$ is *unnecessarily* reported as unknown, and that alone collapses the whole group programme

What is and is not the defect. Blocking $R0/R1$ while retaining ALL when R is *genuinely* unresolved is registered and correct; `estimation.selected` must not be weakened. The defect is the *unnecessary* demotion: a determined value is discarded, so a delivery whose only R -flagged people are ones already proven $R=1$ loses every group contrast although nothing about R is actually unknown.

`construction.py`:252-262 catches an unresolvable R -family code per record and stores it in `indication_issues`; `construction.py`:285 then writes `"R": None` if

`issue else int(pid in indications)`. The `if issue` test wins even when `pid in indications` is already true from a **valid** qualifying code. D2 defines R as a disjunction (“R=1 if **any** ... diagnosis lies in ...”), so **true OR unknown is true**, not unknown — the same Strong-Kleene discipline the package applies to activation.

`estimation.selected` (lines 66-68) then refuses R0 **and** R1 for the entire cohort if any person’s R is null. So one record demotes the whole study’s group programme. On the standard fixture (H=128, R0=64, R1=64) adding a single 2003-06-01 contact carrying DE119A (present in the frozen `study-sks.csv`, valid only from 2003-10-01) to a person who already has a valid DI10 on 2004-05-01 gives:

- `atom-000002: denominator-status.csv` R0 and R1 `data_gap`, ALL available;
- `atom-000004: local_state=data_gap`, every R0/R1 annual row `data_gap`, both principal contrasts `data_gap`, while 54 ALL rows stay available;
- `atom-000008: local_state=data_gap, death_cumulative contrast data_gap`.

Putting the valid DI10 and the invalid DE119A on the *same* contact does the same thing. A person with **no** other qualifying code stays correctly unknown, which is why the fix is a single conditional and not a relaxation of the guard. Blocking R0/R1 while retaining ALL for a genuinely unresolved R is the right registered disposition and should not change.

Fix. `R = 1 if pid in indications else (None if pid in indication_issues else 0)`, leaving `R_status/R_reason` untouched so the flagged record is still reported. **Regression test.** The three `opus_probeA_R.py` cases plus an Atom-4 assertion that the run stays **partial** in the “already evidenced R=1” case.

OP-R2-2 (medium) — a gestational-code date problem silently shrinks the registered T denominator

`construction.py:370-378` wraps all four `coded()` calls in one `try`, so any unresolvable diabetes-family code abandons the whole record and marks the person **unresolved**; `construction.py:381` then assigns U. D2 defines T as “DE11* or DO241* during 1996-2006 and no DE10/DO240”, and `atom-000006` step 1 registers exactly one route to U for such a person: “Type-1 contradictions are U ... without ... reclassifying T”. A DO24x code cannot be DE10*/DO240*, so it can only make **F** uncertain.

`opus_probeE_strata.py`: adding one 2004-06-01 DO244A (valid only 1994–2001) to SYNTHETIC_02_1_T, who has a valid DO241 from 2000 and no type-1 record, moves them to U; `n_T` falls 64→63 and Atom 6’s `t2_inpatient` 2010 ALL goes from numerator/denominator 64/64 to 63/63 — the registered **original_T** denominator changed. (Its interval status also flipped from `interval_unavailable` to `available`, because losing one person broke the degenerate bootstrap; that is a fixture artefact but it shows the change reaches inference.) F’s accounting is correct and unaffected: `excluded_unresolved_diabetes_code` is set and `n_F` stays 64.

Fix. Catch each `coded()` call separately in `strata` and record the unresolved person against the classification the failing code can actually affect, using only the T-relevant set in the line-381 expression while keeping the broader set for F’s negative history. **Regression test.** Valid DO241 + date-invalid DO244A stratum stays T,

`n_T=64`, Atom 6 `original_T=64`, person still excluded from F; a date-invalid DE10-family subtype on the same person still yields U.

OP-R2-3 (medium) — the new predecessor rederivation rejects faithful evidence, and leaves nothing behind on a read failure

`run.py:100–112` now rebuilds D2 locally and compares `cohort_tables` cell for cell before accepting an `atom-000002` predecessor. That is the right answer to CODEX-002, but the comparison covers descriptive columns that do not determine H.

`opus_probeG_optional.py`: run `atom-000002` to `historical_ready`, write a scheduler attestation, then run `atom-000008` under the default policy. With `semantics["baseline.contact_count_history"]` present the run succeeds (partial). Removing **only** that entry — an optional, source-silent lookback that `construction.py:266–275` already handles internally, that the README itself says “leaves those columns unavailable without blocking H or principal endpoints”, and that `atom-000008` has no use for — produces `ValueError: Predecessor D2 aggregate derivation mismatch`, exit 2, and no output. The probe asserts that `run.cohort_binding` is **identical** between the two manifests, so the design’s own notion of core input binding considers them the same delivery.

Because `predecessors()` is called at `run.py:277`, *before* the `try` at line 289, this also means an operational read failure inside the rederivation escapes entirely. `opus_probeF_pred.py` makes LPR_ADM unreadable and gets exit 2 with no `status.json`, no grid and no `terminal: no_result`, although D5 classifies read failures as operational `no_result` and the same `OSError` inside the analysis is mapped correctly by `Analysis.attempt`. A missing `--evidence-trust` behaves the same way; I regard fail-closed refusal on an *integrity* rejection as defensible and do not ask for that to change.

Fix, scoped to one named column rather than a class of rows a forger could choose. `opus_probeT_scope.py` establishes that `baseline.contact_count_history` is the **only** semantic read by `Construction.cohort` that `cohort_binding` does not cover (`BEF.reference_dates`, `BEF.membership_alive_resident`, `VNDS.direction` and `LPR.diagnosis_role` are all inside it), that dropping it leaves `cohort-flow.csv` and `denominator-status.csv` byte-identical, and that it changes exactly one H column (`pre_contacts`) and only the `baseline-summary` rows with `variable == "pre_contacts"` (4 → 9). Those extra `None` rows additionally turn `n` and `denominator_n` into floats, so every other row serializes as 128.0 instead of 128 — which is why the comparison must also be numeric.

- (1) Drop the `variable == "pre_contacts"` rows from the `baseline-summary.csv` comparison (or require them to agree only when **both** sides resolved the lookback), drop the `pre_contacts` column from the H comparison in `load_cohort`, and compare `n/denominator_n` numerically. Keep `cohort-flow.csv`, `denominator-status.csv`, every other `baseline-summary` variable and every other H column exact, so nothing a forged predecessor controls is excluded.

- (2) Catch `OSError` only — keep `ValueError` and `Boundary` tampering rejections fail-closed — and record `terminal: no_result` with the full registered empty grid. **Regression test.** `opus_probeG_optional.py` as written, plus an injected `OSError` case asserting a complete `no_result` grid instead of a bare non-zero exit.

OP-R2-4 (medium) — registered figure text no longer reaches the manuscript

`render_figures.py:63-99` adds a 160 mm note budget; above it, `bounded_canvas` replaces the real status notes with the two-line placeholder at lines 73-74 and moves the notes to continuation pages. `figures.yaml` registers, for every one of figures 2–6, “reason: Exact reason on each nonavailable row, **rendered in the display**”, and figure 6’s caption promises “Exact source and missing-period limits accompany each panel”.

On the actual reference outputs the adapter produces `figure1.pdf` (3 pages) and `figure4/5/6.pdf` (2 pages each), and page 1 of figures 4, 5 and 6 carries the placeholder with zero registered reason strings. I copied `prereg/paper`, dropped in the adapted PDFs, and compiled twice with `pdflatex` using the **unmodified** frozen `figure-shells.tex` (which includes only `figureN.pdf`, i.e. page 1). The 15-page result contains the placeholder and omits 20 of 24 figure-4 note lines, 14 of 18 figure-5 lines, 13 of 17 figure-6 lines, and 24 of 38 `atom-000001` predicates together with their implications. The author’s test 36 asserts complete text only for figure 1, and only after inserting the continuation `\input` into a copied shell, so the frozen-shell case is untested.

Re-rendering the same tables with the 160 mm threshold disabled puts every note back on one page at 192.53 mm (figure 4) and **169.42 mm (figures 5 and 6)** — inside the 170 mm bound the same module already accepts for figure-1 pages. So figures 5 and 6 spill for no reason, and the README’s disposition (“the presentation driver must include the continuation TeX”) defers a known interface mismatch to a downstream stage, which `predata-engineering` explicitly forbids.

Fix — two parts, both required. (a) Raise the note-spill threshold to the 170 mm the module already uses, which removes the spill for figures 5 and 6 outright. (b) For content that genuinely exceeds the budget (figure-4 notes at 192.53 mm, the 38-row audit matrix) use a bounded multi-column block at the same width and font instead of an unbound continuation page. Part (a) alone still leaves figure-4 and figure-1 content out of the manuscript, and the regression test below will still fail. **Regression test.** Compile the copied paper with the **unmodified** `figure-shells.tex` and assert that every nonavailable reason string and every audit predicate/implication appears in `paper.pdf`, and that no page exceeds 170 mm at exactly 130.7 mm width.

4. Per-Atom coverage

Atom	Implementation reviewed	My targeted tests	State
atom-000001	<code>audit.identification</code> <code>audit.causal_targets</code>	Read audit 38, correlates with URLs/dates/locations confirmed <code>not_identified</code> with blank causal targets; swept the whole execution tree for any DiD/RD/IV/matching/survival/significance code (none exists); measured figure-1 pagination and its manuscript reach	Real documentary audit, not a stub. Affected by OP-R2-4
atom-000002	<code>Construction.cohort_tables</code> <code>run.cohort_tables</code>	Repopulation/residence counterexamples (OP-R2-1); age/DOB/residence handling read; <code>denominator-status.csv</code> behaviour under a flagged R; empty- H boundary; forged-H and predecessor rederivation paths	Residence report, OP-R2-1
atom-000003	<code>Analysis.access/operations/strata</code> <code>Construction.operations/strata</code>	Interactions stream/ operations/strata masking test (PRIV_SKSOPR 2008 only); header-only operation sources; component-key uniqueness; capture/financing dispositions; D4/D6 sweep	Separation site/financing, OP-R2-1, OP-R2-2

Atom	Implementation reviewed	My targeted tests	State
atom-000004	Analysis.hospital/episode/stream, construction.episodes	episodes-episode oracle for all 18 years (0 differing); blast-radius run under OP-R2-1; era-split and sensitivity component coverage; D4/D6 sweep	Sound; OP-R2-1 turns it to <code>data_gap</code>
atom-000005	Analysis.incident/diabetes, Construction.strata/diabetes	Diabetes, own strata/diabetes competing-risk cases (pre-1996 under a 1977 lineage, 1996–2006 window, entry-day event, same-day DE10/DE11); competing partition; F exclusion accounting	Fixed and correct; inherits OP-R2-1; figure 4 affected by OP-R2-4
atom-000006	Analysis.treatment/drug_months, Construction.strata	Treatment/drug_months, strata classification counterexample (OP-R2-2); duration categories; no-dispensing proportion; unit separation	OP-R2-2
atom-000007	Analysis.psychiatric/contact_events, Analysis.episode/stream/drug_months	Psychiatric/contact_events, episode/stream/drug_months PSYK; zero self-harm codes; injected <code>drug_months</code> failure with full component inventory check	affected by OP-R2-4

Atom	Implementation reviewed	My targeted tests	State
atom-000008	<code>Analysis.mortality.episode</code> <code>Construction.vitality</code>	Ty (episodes) 2024 cumulative-mortality oracle (32/128 = 250.0000); tie oracle; predecessor consumption matrix (OP-R2-3); no-retry on a <code>no_result</code> predecessor; relocated read-only run	OP-R2-3; inherits OP-R2-1
atom-000009	<code>Analysis.safety</code> , <code>safety.execute_safety</code>	Independent 0–30 first-window oracle (84/128 = 656.2500); exactly eight figure rows under both a populated and an empty operation cohort; injected late-component failure; private-gap fallback	Sound

5. Cross-cutting checks that passed

- **Numerical fidelity.** Three independent oracles written from the fixture CSVs reproduce the implementation exactly (acute episodes for all 18 years; cumulative mortality; the safety first-window fraction). I re-derived the I5 municipality cluster bootstrap from `identification.md` alone — 32 clusters, 9,999 draws, seed 20260905, PCG64, linear quantiles at .025/.975 — and matched the point estimate and both limits to $\sim 1e-12$. The <30 municipality, >1% undefined and degenerate-interval guards are registered and all fire.
- **Schema.** 8,517 `annual/periods/contrasts` rows across 57 files and five scenarios (full run, all-unactivated, zero operations, zero psychiatry, and the OP-R2-1 blocked-group run) satisfy every D4/D6 invariant: legal statuses, correct unit and clock per registered metric, finite ordered limits on `available` rows, blank limits with a retained estimate on `interval_unavailable`, blank numerics and a non-blank reason everywhere else, no `causal` mode. Zero duplicate D4 keys and zero duplicate component keys.

- **Identity and isolation.** `verify_world` accepts a relocated World with an edited `atom-000005` body/`atom_result` and an edited Molecule current interpretation, and rejects an edited Atom protocol, an edited `data-contract.md`, an edited Molecule membership and an edited frozen figure template. Output-inside-World, private-inside-World, overlapping roots, unregistered tables, unauthorized manifests and re-running into a non-empty Atom directory are all refused. The read-only World run left no `__pycache__`.
- **Dispatch.** Direct dispatch bypasses only outer activation: a `no_result` `atom-000002` predecessor is not retried and yields `terminal: no_result` with the registered reason; a scientific predecessor needs a scheduler attestation outside the manifest plus the registered output inventory, schema and principal grid.
- **Component coverage.** Every registered supplementary component I enumerated from the protocols appears in the actual outputs for Atoms 3–9. The only two absent names, `captured_union` and `narrower_coded_subset`, are conditional branch labels and both appear in the scenarios that trigger them.

6. What remains unavailable, and why

The whole causal programme is unavailable **by registered design** (identification.md I1–I3; `atom-000001 not_identified`). No RD bandwidth/kernel/bias correction, modern staggered-DiD comparison, matching, weighting or survival risk set exists anywhere in `prereg/execution`, and none is authorized here; their absence is faithfulness, not omission. Every `causal-targets.csv` row is blank with `mode=causal_target_unidentified` and `status=not_identified`.

No real Danish register data exists in this environment, so **every empirical result for all nine Atoms remains unavailable**. Delivered field labels, code distributions, coverage calendars, key uniqueness, PNR12/PNR bijectivity, municipality counts and full-scale runtime cost are unverified. The author’s source-silent gaps (baseline lookback starts, band-removal and mesenteric-defect code sets, LMDB reconciliation, payer meanings, external-cause completeness, LPR2/LPR3 continuity, historical ATC, the finer D3 emigration-day exception) are genuine, narrowly scoped, and each stops at a named runtime input rather than a default. `prereg/execution` and `prereg/engineering` are still outside `manifest.yaml` and `CHECKSUMS.sha256`; that is a host/packaging action, but it means `source-manifest.json`’s trust root is only as protected as the World itself — which the README states plainly.

Not tested: governed execution, production Helvetica Neue rendering (no font bundle is supplied in this study’s resources, so the `--style-dir` branch of test 36 was not exercised in my run), live re-retrieval of the frozen source URLs, and full-scale performance. No R, Stata or QGPU engine was run; none is required and none was substituted.

7. Recommendation

Fix OP-R2-1 through OP-R2-4 with the narrow changes and regression tests above. Nothing here asks for a new research question, a new analysis, a different estimator or any change to the frozen protocol. With those four repaired, the round-3 package

would in my judgment be acceptable as faithful, tested engineering within explicitly stated limitations — which is not observed science, original-protocol approval or replication.

r03 / opus.md

Round-3 independent engineering review — Opus

Verdict: revise. Seven defects: four carried forward unrepaired from round 2, three new.

R03-1, R03-2 and R03-7 are three instances of **one defect family** — a determinate fact discarded because an adjacent record that cannot bear on it is unresolvable. Patching the two sites named in R03-1 and R03-2 leaves the pattern alive; please sweep for it.

This is an engineering/source-fidelity review of v003/world/prereg/execution and prereg/engineering. It is not scientific acceptance of the user-frozen design (prereg/manifest.yaml records `scientific_review_status: not_accepted_current_revision`), not replication, and not approval of the original protocol. No empirical result exists for any of the nine Atoms; every number below is a synthetic-fixture test value.

0. The decisive round-3 fact

There is no round-3 revision.

```
$ diff -rq v002/world v003/world
$ echo $?
0
```

The snapshot is byte-identical to the one round 2 reviewed. logs/r03-author-a01.log contains the author prompt and then:

```
ERROR: You've hit your usage limit. Visit
↳ https://chatgpt.com/codex/settings/usage
to purchase more credits or try again at Sep 12th, 2026 6:49 AM.
```

No tool call, no edit. prereg/governance.md and data-contract.md D5 are explicit that an operational failure is not a scientific or engineering result. It therefore neither repairs the open findings nor excuses them, and it is not itself a code defect.

Because the bytes are unchanged, I did **not** treat the round-2 report as an oracle. I re-executed each of its four findings against this snapshot with my own probes, re-derived the external facts they depend on from the **cited public source**, and spent the remaining budget hunting for defects no earlier round covered. That hunt produced two.

1. What I ran

Artifact	Location
Copied action code	<code>scratch/r03/opus/action/execution</code>
Relocated read-only World	<code>scratch/r03/opus/roworld</code>
Advertised suite output	<code>scratch/r03/opus/testout</code> , <code>testout2</code>
My probes	<code>scratch/r03/opus/probes/probe_*.py</code>
Probe outputs	<code>scratch/r03/opus/probes/out/</code>

Nothing was written into the World, the immutable source, controller files, repository resources or another reviewer’s outputs. The round-3 output of the other reviewer was not read.

Environment: Python 3.12.4, NumPy 1.26.4, pandas 2.2.3, SciPy 1.15.2, PyYAML 6.0.2, Matplotlib 3.10.0, PyMuPDF 1.24.9, plus `pdflatex` and `Rscript`. This matches `prereg/execution/requirements-tested.txt` exactly. No shared environment was changed.

2. Per-Atom coverage

All nine Atoms run end to end from the copied action directory against the relocated World.

Atom	Topic	Realized state	What I checked beyond running it
atom-000001	Policy identification	not_identified	38 documentary predicates with URLs, dates and locators; all five regions, both age bounds, all five qualifying conditions, suitability, grandfathering, concurrent 2008/2011 changes, later regime and every alternative measurement source present. 8 blank <code>causal-targets.csv</code> rows, all <code>not_identified</code> . Finding R03-4: only 14 of the 38 predicates reach the compiled manuscript.
atom-000002	Historical clinical population	historical_ready	Cohort flow, baseline summary and denominator status; age/anchor/migration/DOB rules read against D2. Finding R03-5 (new): a zero pre-2007 contact count is reported as category 2-4. Finding R03-1: R is discarded when a proven R=1 co-occurs with an unresolvable subtype.

Atom	Topic	Realized state	What I checked beyond running it
atom-000003	Recorded surgical access	partial	15 component labels present; capture.csv , financing.csv , public/private scope selection, code-introduction flags, prior-surgery documentation. Principal stable_operations contrast emitted. Collapses to data_gap under R03-1.
atom-000004	Acute hospital burden	partial	11 components; both principal contrasts; overlap_only / any_position / era-split sensitivities with concordance labels. Independent oracle : all 54 annual acute_all cells reproduce exactly. Collapses to data_gap under R03-1.

Atom	Topic	Realized state	What I checked beyond running it
atom-000005	Recorded diabetes incidence	partial	20 components; competing partition sums to N in every year/group; D0244 correctly treated as gestational-only and not a competitor; same-day non-T2 correctly wins the tie. Finding R03-7 (new): an unrelated same-day contact demotes both first-diagnosis contact-type descriptors. Its original_F membership is perturbed by R03-2.
atom-000006	Diabetes treatment burden	partial	13 components; a10_months and t2_inpatient kept on separate units; insulin/non-insulin splits; duration categories; no_recorded_dispensing . Finding R03-2: original_T shrinks on an unresolvable obstetric subtype.

Atom	Topic	Realized state	What I checked beyond running it
atom-000007	Psychiatric treatment	partial	16 components; psych_starts counts contact starts not visits; self_harm uses DX60–DX84 with descendants; alcohol admissions correctly not restricted to acute; the narrower_coded_subset branch fires when external-cause capture is incomplete. Collapses to data_gap under R03-1.
atom-000008	All-cause mortality	partial	9 components; annual increments reconcile to the cumulative series. Independent oracle: death_cumulative 2024 = $32/128 = 250.0000$ per 1000 in ALL, R0 and R1, with the emigrant-who-later-dies excluded and the pre-reform death retained in the fixed denominator. Collapses to data_gap under R03-1.

Atom	Topic	Realized state	What I checked beyond running it
atom-000009	Surgical safety	partial	34 component labels; the exact figure interface is honoured — precisely eight window_first_event rows for potential_complication and gi_reoperation with the registered anchor, calendar period, denominator type, unit and 0-30/31-90/91-365/366-1825 periods, plus the separate status-only 0-30 repeat_named row. Independent oracle: potential_complication 0-30 = 84/128 = 656.2500. Collapses to data_gap under R03-1.

3. Findings

R03-1 (high, carried forward) — a proven R=1 is thrown away

`construction.py:285` reads `"R": None if issue else int(r.PNR in indications)`. D2 defines R as a *disjunction* over records, so one valid qualifying code determines R=1; the flag on a separate unresolvable record must not erase it. In Kleene terms **true OR unknown = true**.

I checked **both** halves, which matters for the fix:

- SYNTHETIC_00_1_F has R=1 from a **valid** DI10 dated 2004-05-01. Adding one 2003-06-01 contact carrying DE119A (valid only from 2003-10-01) turns R into **nan**. **Wrong.**

- SYNTHETIC_00_0_F has no qualifying code. The same invalid code correctly leaves R = None (false OR unknown = unknown). **Right — do not weaken estimation.selected.**

Blast radius, measured through the CLI on that one added row (`probe_blast.py`):

```
atom-000003: data_gap  stable_operations:data_gap
↳ ALL_available=58
atom-000004: data_gap  acute_all:data_gap, acute_cv:data_gap
↳ ALL_available=54
atom-000007: data_gap  psych_starts:data_gap, self_harm:data_gap
↳ ALL_available=36
atom-000008: data_gap  death_cumulative:data_gap
↳ ALL_available=2
atom-000009: data_gap  comp_hospital:data_gap, repeat_procedure:data_gap
↳ ALL_available=80
```

Five of the seven numeric Atoms lose every registered group contrast because of one record, for a person whose R is fully determined. (Atoms 5 and 6 survive only by accident: R03-2 removes the same person from F/T first.)

Fix: one line — "R": 1 if r.PNR in indications else (None if issue else 0), keeping R_status/R_reason untouched so the flagged record is still reported.

R03-2 (medium, carried forward) — an obstetric subtype demotes a verified T member

`construction.py:370-378` wraps all four `coded()` calls in one `try`, so a failure on any of them marks the person unresolved, and line 381 then assigns U. A D024x code is neither DE10* nor D0240*, so under D2 it cannot make T uncertain — it can only affect F's negative history.

Adding one 2004-06-01 D0244A (valid only 1994-01-01..2001-12-31) to SYNTHETIC_02_1_T, which has a valid D0241 from 2000-04-01, moves it to U: counts go from {T: 64, U: 64} to {T: 63, U: 65}. The correct path is intact — a date-valid DE109A also yields U, but with `stratum_status = available`, which is the registered type-1 contradiction.

Fix: catch each `coded()` call separately and use only the T-relevant unresolved set at line 381.

R03-3 (medium, carried forward) — the predecessor rederivation is too strict and fails open-ended

`predecessors()` is called at `run.py:277`, before the `try` at `run.py:289`. Two consequences, both reproduced:

```
with optional semantic present -> partial
cohort_binding identical: True
dropped optional semantic -> REJECTED ValueError: Predecessor D2
↳ aggregate derivation mismatch
  output directory created: False
same manifest, direct dispatch -> partial
```

```
unreadable LPR_ADM          -> UNCAUGHT PermissionError
  output directory created: False  status.json: False
unreadable inside analysis  -> no_result | Operational analysis failure:
↳ PermissionError
  status.json: True
```

The last two lines are the whole argument: the *identical* failure is handled correctly inside the analysis and catastrophically inside the rederivation.

Fix: (1) exclude only the `pre_contacts` rows/column from the comparison, comparing `n` and `denominator_n` numerically; (2) wrap **only** `OSError` so it records `terminal: no_result` with the full grid. Keep `ValueError` and `Boundary` tampering rejections fail-closed.

Ordering constraint with R03-5: R03-5's repair introduces a *new* `baseline-summary.csv` row shape for out-of-partition counts. The exclusion rule here must cover that new shape too, or the mismatch returns in a different form once both fixes land. Land R03-5 first, write this exclusion against the post-fix row set, and assert the combination in one test.

R03-4 (medium, carried forward) — registered strings never reach the manuscript

`render_figures.py:66-77` swaps the real notes for a two-line placeholder above 160 mm, even though the same module accepts 170 mm pages at line 50. The continuation pages it writes are bound by `figureN-continuations.tex`, and the frozen `figure-shells.tex` contains neither `continuation` nor `-page-` — `\includegraphics` takes page 1 only.

Measured on the real synthetic outputs, then compiled with the **unmodified** shell:

- `figure1.pdf`: 3 pages (156.97 / 160.53 / 132.08 mm); 14 of 38 predicates on page 1.
- `figure4/5/6.pdf`: 2 pages each; page 1 carries the literal placeholder and **zero** of their registered nonavailable reason strings.
- Compiled `paper.pdf` (15 pages): contains the placeholder; **24 of 38** audit predicates and 8 of 14 distinct implications are absent — including every `region_*` predicate and `age_change_2008`, i.e. precisely the institutional-chronology evidence `atom-000001` exists to display.

I also exercised the `--style-dir` publication branch that round 2 listed as untested, installing a substitute font under the four required `HelveticaNeue-*.ttf` names. The branch works (rc 0, `style_dir_supplied: true` for all seven figures, width 130.7 mm, max height 160.53 mm) and the pagination and placeholder are **identical**. So this defect is not a default-font artifact — though the exact millimetre heights remain metric-dependent, and real Helvetica Neue is still untested.

Fix: raise the note-spill threshold to the module's own 170 mm *and* use a bounded multi-column block for the 38-row predicate matrix. Both parts are required.

R03-5 (medium, new) — a zero pre-2007 contact count is reported as “2-4”

run.py:241:

```
if variable=="pre_contacts": vals=vals.map(lambda x:"1" if x==1 else "2-4" if
↪ x<5 else "5+")
```

0 is not 1 and is < 5, so it lands in 2-4. atom-000002 step 3 registers exactly three categories — (1, 2-4, 5+) — and no zero cell.

This is reachable because `Construction.cohort` (`construction.py:266-275`) accepts **any** supplied `baseline.contact_count_history` whose end is 2006-12-31, and `prereg/execution/README.md` line 101 states the start “is not stated in the frozen protocols”. Since H members enter through a DE660D contact starting 2005-01-01..2006-12-31, any supplied start after 2005-01-01 can produce zero counts. The author’s fixture pins the start at 2003-01-01 (`synthetic.py:21`), where zero is impossible, and the only related test (`run_tests.py:492`) *removes* the semantic rather than narrowing it — so this branch has never been exercised.

Executed, with a mixed fixture (the realistic case):

```
raw pre_contacts value counts: {2: 64, 0: 64}
  variable category group  n denominator_n  status reason
pre_contacts  2-4  ALL 128          128 available
TRUE 2-4 members: 64  REPORTED as '2-4' (ALL): 128
```

The registered category is inflated 100%, reported as **available** with a **blank reason**, and `compare_table` reproduces the same wrong value downstream, so no integrity check fires. The genuinely-unresolved path is correct by contrast: with the semantic absent entirely, all three categories are emitted as `data_gap` rows with the exact `STOP_UNRESOLVED_SOURCE` reason.

Fix: in `run.cohort_tables`, build the categories from counts ≥ 1 and emit the remaining people as an explicit nonavailable row naming the supplied window and the fact that a zero count is outside the registered partition. Do **not** invent a 0 category as a scientific default, and do not silently reject narrow windows — the registered disposition is the author’s to state, but “report it as 2-4 with status **available**” is not among the contract’s options.

R03-7 (low, new) — an unrelated same-day contact discards a determinate fact

analyses.py:372:

```
source_rows=st.data[(st.data.pid==r.pid)&(st.data.start==r.date)]
flags={ipmap.get(k) for k in source_rows.key}
if None in flags or len(flags)!=1: # -> data_gap
```

This selects **every** contact the person has starting on the T2 event date, not just the one carrying the qualifying diagnosis. atom-000005 step 5 registers “first T2

diagnosis on inpatient versus outpatient contact” — the patient type of the contact that *carries* the code. A concurrent unrelated record cannot bear on that.

Executed. In the fixture, `SYNTHETIC_01_0_F` and `SYNTHETIC_01_1_F` carry their first post-entry DE11 on an **outpatient** contact dated 2010-03-01:

```
[baseline] t2_inpatient_first: available numerator=12 estimate=187.5
[baseline] t2_outpatient_first: available numerator=26 estimate=406.25
           87 of 108 rows available, 0 data_gap

[+1 same-day inpatient contact with NO diagnosis rows at all]
           t2_inpatient_first: data_gap "first diagnosis contact type
           ↪ unresolved or tied across types"
           t2_outpatient_first: data_gap
           0 of 108 rows available, 90 data_gap
```

Two records that carry no diagnosis at all erase the entire registered ascertainment description across the F stratum. Same-day concurrent contacts are common in real LPR data, so this should be expected to fire broadly.

Correctly insulated, and why the severity is low: the principal `t2_cumulative` 2024 ALL stays **available** at numerator 38 in both runs. The descriptor does not gate definite T2 dating, exactly as step 5 requires (“Never gate T2 estimation on these outcomes”).

Fix: carry the source contact key alongside each T2 event where the event list is built (`analyses.py:344-356`, which already has `r.key`) and look up only that key’s flag. Keep the `data_gap` disposition for the case it was written for — the *same qualifying code* on two same-day contacts of different patient type.

R03-6 (low, new) — the suite has no mode normalization where `test_15` does

`test_33` at `run_tests.py:692` does `shutil.copytree(...)` — which preserves file modes — and then mutates the copy. `test_15` at `run_tests.py:327` already normalizes modes for exactly this reason; `test_33` does not.

```
World copy at mode 444: Ran 39 tests in 235.974s - FAILED (errors=1)
  PermissionError: [Errno 13] .../authenticated_action/analyses.py
Same copy at mode 644:  Ran 39 tests in 248.698s - OK (0 failures, 0 errors)
```

Against my own finding: I have *not* established that 444 is the delivery mode. `v001`, `v002` and `v003` are all 444, but the controller’s working copy at `scratch/r03/host/attempt-01/world` is 644 — consistent with the controller materializing a writable copy for execution and marking archived review snapshots read-only afterwards. Round 2 met the identical 444 on `v002` and reported 0 errors. So 444 is plausibly a snapshot artifact, and the author is entitled to say so.

What survives that qualification is the asymmetry itself: the harness mutates a copied action tree with no mode normalization, in a package whose skill file explicitly asks for the copied-action-against-read-only-World case to be tested. **Scope:** `run.py` only reads and is unaffected; this is a test-harness defect, not an analysis-code defect, it invalidates no numerical result, and it alone would not justify **revise**.

Fix: `chmod` the copied tree in `test_33` before the mutation loop, as `test_15` already does.

4. What I verified positively

- **Independent oracles, written from D2/D3/D6 and the fixture generator rather than from the implementation, reproduce it exactly.** All 54 `acute_all` annual cells (18 years $\times$ ALL/R0/R1) match on numerator, denominator and estimate to 1e-9; `death_cumulative` 2024 matches in all three groups; the safety 0-30 window matches. My reimplementations of the D3 next-day merge and first-acute-admission rule agrees with the author's on every cell.
- **Source fidelity, checked against the cited public locator, not against an earlier review.** Re-parsing `resources/schema/originals/health-classifications/sks/SKScomplete.txt` (sha256 27cbf709..., matching `classification-provenance.yaml`) at the documented fixed-width offsets reproduces **all 1,803 codes and 3,477 rows** of `prereg/evidence/study-sks.csv` with zero differences, and confirms the two validity intervals R03-1 and R03-2 turn on (DE119A from 2003-10-01; D0244A only 1994-01-01..2001-12-31).
- **D4/D6 conformance:** 51 annual/periods/contrasts files (6,649 rows) and 17 `components.csv` files (7,496 rows) across six scenarios — zero violations.
- **Registration identity works both ways:** a relocated World with an edited `atom-000005` body, changed `atom_result` and appended Molecule interpretation is **accepted**; an edited protocol, edited `data-contract.md`, edited membership role and a one-byte figure-template change are each **rejected**.
- **Guards hold:** `output-inside-World`, `private-inside-World`, `unauthorized manifest`, `out-of-projection table` and `nonempty-directory rerun` all rejected; `not_activated` under the default policy; a `no_result` predecessor not retried under direct dispatch; no `__pycache__` in the World.
- **No causal estimator exists** anywhere in `prereg/execution` — a `grep` for `DiD` / `Callaway-Sant'Anna` / `rdrobust` / `bandwidth` / `propensity` / `Cox` / `matching` / `IV` / `two-stage terms` returns nothing, and all nine `causal-targets.csv` files carry only blank estimates with `not_identified`.
- **Package integrity:** `v003/world` differs from `.controller/source` only by the added `prereg/engineering` and `prereg/execution`; all 89 `CHECKSUMS.sha256` entries pass.

One correction to my own work: my first D4/D6 sweep reported 1,002 violations. Those were an error in *my* check — it applied D4's interval requirement to registered person-count component rows that carry a numerator and denominator but no rate. Corrected and re-run: zero violations.

5. What remains unavailable, and why

The registered causal programme is unavailable **by design**, and that is faithful, not a defect. `identification.md` I1-I3 establish the boundary; `atom-000001` returns `not_identified`; every `causal-targets.csv` row is blank. There is consequently no

bandwidth, kernel, staggered-DiD weighting scheme, matching estimator, clustered regression variance or competing-risk hazard model to audit — the only inference in the package is the I5 municipality cluster percentile bootstrap.

No real Danish register data exists in this environment. **Every empirical result for all nine Atoms remains UNAVAILABLE.** Nothing in this review supplies a numerical study finding; the numbers above are synthetic-fixture test values. Delivered field labels, code distributions, coverage calendars, key uniqueness, PNR12/PNR bijectivity and full-scale runtime cost are unverified.

Not tested: real governed execution; full-scale performance; production Helvetica Neue metrics (the `--style-dir` code path is now tested with a substitute font, the true metrics are not); live re-fetch of the four frozen policy URLs (the SKS classification source *was* independently re-parsed); no R, Stata or external engine was run, and none was substituted.

6. What revise asks for

Seven narrow code fixes and their regression tests, listed with exact locations in `opus.yaml`. None requires a new research question, a new analysis, a new Atom, or any change to the frozen protocol.

Two things to weight when acting on this. First, R03-1, R03-2 and R03-7 share one root shape — “unresolved *anywhere* blocks determinate *here*” — so the useful response is an audit of every site where a `try/except` block or a set-cardinality test spans more records than the registered question depends on, not three isolated patches. Second, R03-3 and R03-5 must be fixed in that order, since R03-5 changes the row set R03-3’s comparison rule has to describe.

The four carried-forward items need the author to actually get a turn — the round-3 invocation never ran.

Complete registered Molecule

```
id: molecule-000001
molecule_mode: prereg
molecule_shape: boundary_map
topic: Bariatric access health
rating: C-
draft: false
membership:
- atom: atom-000001
  role: primary
  description: Institutional/eligibility/counterfactual identification
  ↪ boundary
- atom: atom-000002
  role: secondary
  description: Historical clinical denominator and baseline grouping
- atom: atom-000003
  role: primary
  description: Recorded operation access, capture and disease-stratum patterns
- atom: atom-000004
  role: primary
  description: All-cause and cardiovascular acute hospital burden
- atom: atom-000005
```

```

role: secondary
description: Cumulative recorded type-2 diabetes in the baseline
  ↳ disease-free
    stratum
- atom: atom-000006
  role: secondary
  description: Medication and inpatient burden in prevalent type-2 diabetes
- atom: atom-000007
  role: secondary
  description: Psychiatric service use and related recorded harms
- atom: atom-000008
  role: secondary
  description: Cumulative all-cause domestic-record mortality
- atom: atom-000009
  role: secondary
  description: Complications, reinterventions and operation-clock safety
literature: []
frontier:
  rule: Did the Danish 2010-2011 tightening of publicly funded bariatric
    ↳ access
      alter long-term acute illness relative to clinically prioritized patients,
      with distinct metabolic, psychiatric, mortality and surgical-safety
    ↳ consequences?
  avoid: No causal claim without eligibility and counterfactual
    ↳ identification;
      no successful-candidate label for a descriptive fallback; no
    ↳ future-treatment
      selection, health index, medication-only remission, or invented empirical
      evidence.
  directions: []
preregistration:
  mode: adaptive
  question: Did the Danish 2010-2011 tightening of publicly funded bariatric
    access alter long-term acute illness relative to clinically prioritized
    patients, with distinct metabolic, psychiatric, mortality and
    ↳ surgical-safety
    consequences?
  scope: One attempted clinical-group policy-ITT question under a documented
    identification boundary. Prospective numerical modules describe a fixed
    pre-2007 historically hospital-coded clinical population, ages 25-59 at
    the reform, under actual policies through 2024; they do not replace the
    central causal target.
  storyline: The policy allocation question comes first. Atom-000001 audits
    assignment and the missing clinical/counterfactual evidence. Atom-000002
    independently determines whether a historical pre-exposure risk population
    can be measured. Recorded surgery access follows before health in the
    paper, with whole-H and diabetes-stratum scope explicit. Acute hospital
    burden is the main intended health question; diabetes incidence,
    ↳ prevalent-disease
    treatment, psychiatric care and mortality each retain independent
    ↳ scientific
    interpretation. Surgical safety retains the population and operation
    ↳ clocks,
    independent complication/reintervention failures and attribution limits.
    All Atoms are members from birth. The paper may report a causal design
    boundary and measurable supplementary descriptions, but cannot claim the
    requested causal question was successfully answered. Interpretation is
    not an extra synthesis experiment.
  interpretation:
  - kind: restriction

```

```

condition: 'TRUE'
says: Under every result combination this version has no identified causal
      estimator. Historical H/R, descriptive differences, access strength,
      compatibility of pre-period profiles and successful code execution
      ↪ cannot
      be presented as a policy ITT, surgery effect, causal mediation,
      ↪ successful
      causal candidate, remission, welfare index or scientific acceptance.
      Component scope, measurement and censoring/competing-event limits always
      constrain numeric narration.
- kind: restriction
  condition: state(atom-000001) == "otherwise" OR terminal(atom-000001)
    == "no_result"
  says: The audit is unresolved or operationally failed. Do not equate
        ↪ missing
        resolution with validated eligibility or a negative effect. The existing
        registration-level prohibition on causal estimation still applies.
- kind: primary
  condition: state(atom-000001) == "not_identified"
  says: The source/schema audit establishes an identification boundary for
        the intended 2011 clinical-group policy ITT. The central causal question
        remains unanswered; this is a candidate boundary, not a statistical
        null and not a successful descriptive replacement.
- kind: restriction
  condition: state(atom-000002) == "data_gap" OR state(atom-000002) ==
    ↪ "otherwise"
    OR terminal(atom-000002) == "no_result"
  says: H-dependent numerical experiments have no authorized denominator
        and remain not_activated. Report the exact cohort boundary or
        ↪ unresolved/operational
        state. Preserve the policy audit independently.
- kind: supplementary
  condition: state(atom-000002) == "historical_ready"
  says: A fixed historical clinical population can support registered
        ↪ domestic-record
        descriptions. It is not the reform-time eligible population. Retain
        baseline selection, prior operations, clinical coding and group-empty
        limitations.
- kind: restriction
  condition: state(atom-000003) == "data_gap"
  says: 'Recorded operation access, capture and disease-stratum patterns:
        no complete principal endpoint is available. Describe the evidenced
        source/phenotype boundary without an effect estimate or null claim;
        independently retained supplementary components remain scoped.'
- kind: restriction
  condition: state(atom-000003) == "partial"
  says: 'Recorded operation access, capture and disease-stratum patterns:
        only the named available components/windows and valid intervals may
        be interpreted. Publish their individual directions, exact missing
        ↪ reasons
        and uncertainty limits. Missing one component is not negative evidence
        about another.'
- kind: supplementary
  condition: state(atom-000003) == "higher"
  says: 'Recorded operation access, capture and disease-stratum patterns:
        report the registered higher descriptive contrast(s), with exact time,
        target, units and pointwise intervals. This concerns recorded group
        patterns; it does not establish causal benefit or harm. All
        ↪ measurement/attribution
        limits and any opposed or unavailable registered sensitivities must

```

```

    accompany this wording.'
- kind: supplementary
  condition: state(atom-000003) == "lower"
  says: 'Recorded operation access, capture and disease-stratum patterns:
    report the registered lower descriptive contrast(s), with exact time,
    target, units and pointwise intervals. This concerns recorded group
    patterns; it does not establish causal benefit or harm. All
    ↳ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000003) == "otherwise"
  says: 'Recorded operation access, capture and disease-stratum patterns:
    report estimates/components where valid and unresolved directions where
    intervals touch/span zero or mapping evidence remains ambiguous.
    ↳ Unresolved
    is not equivalence, insignificance, a weak causal first stage or no
    clinical importance.'
- kind: restriction
  condition: terminal(atom-000003) == "no_result"
  says: 'Recorded operation access, capture and disease-stratum patterns:
    execution did not yield a scientific result. Publish no_result and exact
    reason, without substituting a null. Other independently measurable
    experiments remain governed by their own activation and evidence.'
- kind: restriction
  condition: state(atom-000004) == "data_gap"
  says: 'All-cause and cardiovascular acute hospital burden: no complete
    principal endpoint is available. Describe the evidenced source/phenotype
    boundary without an effect estimate or null claim; independently
    ↳ retained
    supplementary components remain scoped.'
- kind: restriction
  condition: state(atom-000004) == "partial"
  says: 'All-cause and cardiovascular acute hospital burden: only the named
    available components/windows and valid intervals may be interpreted.
    Publish their individual directions, exact missing reasons and
    ↳ uncertainty
    limits. Missing one component is not negative evidence about another.'
- kind: supplementary
  condition: state(atom-000004) == "higher"
  says: 'All-cause and cardiovascular acute hospital burden: report the
    registered higher descriptive contrast(s), with exact time, target,
    units and pointwise intervals. This concerns recorded group patterns;
    it does not establish causal benefit or harm. All
    ↳ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000004) == "lower"
  says: 'All-cause and cardiovascular acute hospital burden: report the
    registered lower descriptive contrast(s), with exact time, target, units
    and pointwise intervals. This concerns recorded group patterns; it does
    not establish causal benefit or harm. All measurement/attribution limits
    and any opposed or unavailable registered sensitivities must accompany
    this wording.'
- kind: supplementary
  condition: state(atom-000004) == "discordant"
  says: 'All-cause and cardiovascular acute hospital burden: principal
    ↳ components
    have opposing descriptive directions. State both with their units and

```

```

    intervals; no uniform benefit, harm or average score follows.'
- kind: supplementary
  condition: state(atom-000004) == "otherwise"
  says: 'All-cause and cardiovascular acute hospital burden: report
    ↳ estimates/components
      where valid and unresolved directions where intervals touch/span zero
      or mapping evidence remains ambiguous. Unresolved is not equivalence,
      insignificance, a weak causal first stage or no clinical importance.'
- kind: restriction
  condition: terminal(atom-000004) == "no_result"
  says: 'All-cause and cardiovascular acute hospital burden: execution did
    not yield a scientific result. Publish no_result and exact reason,
    ↳ without
      substituting a null. Other independently measurable experiments remain
      governed by their own activation and evidence.'
- kind: restriction
  condition: state(atom-000005) == "data_gap"
  says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
    stratum: no complete principal endpoint is available. Describe the
    ↳ evidenced
      source/phenotype boundary without an effect estimate or null claim;
      independently retained supplementary components remain scoped.'
- kind: restriction
  condition: state(atom-000005) == "partial"
  says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
    stratum: only the named available components/windows and valid intervals
    may be interpreted. Publish their individual directions, exact missing
    reasons and uncertainty limits. Missing one component is not negative
    evidence about another.'
- kind: supplementary
  condition: state(atom-000005) == "higher"
  says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
    stratum: report the registered higher descriptive contrast(s), with
    exact time, target, units and pointwise intervals. This concerns
    ↳ recorded
      group patterns; it does not establish causal benefit or harm. All
    ↳ measurement/attribution
      limits and any opposed or unavailable registered sensitivities must
      accompany this wording.'
- kind: supplementary
  condition: state(atom-000005) == "lower"
  says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
    stratum: report the registered lower descriptive contrast(s), with exact
    time, target, units and pointwise intervals. This concerns recorded
    group patterns; it does not establish causal benefit or harm. All
    ↳ measurement/attribution
      limits and any opposed or unavailable registered sensitivities must
      accompany this wording.'
- kind: supplementary
  condition: state(atom-000005) == "otherwise"
  says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
    stratum: report estimates/components where valid and unresolved
    ↳ directions
      where intervals touch/span zero or mapping evidence remains ambiguous.
      Unresolved is not equivalence, insignificance, a weak causal first stage
      or no clinical importance.'
- kind: restriction
  condition: terminal(atom-000005) == "no_result"
  says: 'Cumulative recorded type-2 diabetes in the baseline disease-free
    stratum: execution did not yield a scientific result. Publish no_result

```

```

    and exact reason, without substituting a null. Other independently
    ↪ measurable
    experiments remain governed by their own activation and evidence.'
- kind: restriction
  condition: state(atom-000006) == "data_gap"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes: no
    complete principal endpoint is available. Describe the evidenced
    ↪ source/phenotype
    boundary without an effect estimate or null claim; independently
    ↪ retained
    supplementary components remain scoped.'
- kind: restriction
  condition: state(atom-000006) == "partial"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes: only
    the named available components/windows and valid intervals may be
    ↪ interpreted.
    Publish their individual directions, exact missing reasons and
    ↪ uncertainty
    limits. Missing one component is not negative evidence about another.'
- kind: supplementary
  condition: state(atom-000006) == "higher"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes:
    ↪ report
    the registered higher descriptive contrast(s), with exact time, target,
    units and pointwise intervals. This concerns recorded group patterns;
    it does not establish causal benefit or harm. All
    ↪ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000006) == "lower"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes:
    ↪ report
    the registered lower descriptive contrast(s), with exact time, target,
    units and pointwise intervals. This concerns recorded group patterns;
    it does not establish causal benefit or harm. All
    ↪ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000006) == "discordant"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes:
    ↪ principal
    components have opposing descriptive directions. State both with their
    units and intervals; no uniform benefit, harm or average score follows.'
- kind: supplementary
  condition: state(atom-000006) == "otherwise"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes:
    ↪ report
    estimates/components where valid and unresolved directions where
    ↪ intervals
    touch/span zero or mapping evidence remains ambiguous. Unresolved is
    not equivalence, insignificance, a weak causal first stage or no
    ↪ clinical
    importance.'
- kind: restriction
  condition: terminal(atom-000006) == "no_result"
  says: 'Medication and inpatient burden in prevalent type-2 diabetes:
    ↪ execution
    did not yield a scientific result. Publish no_result and exact reason,

```

```

    without substituting a null. Other independently measurable experiments
    remain governed by their own activation and evidence.'
- kind: restriction
  condition: state(atom-000007) == "data_gap"
  says: 'Psychiatric service use and related recorded harms: no complete
    principal endpoint is available. Describe the evidenced source/phenotype
    boundary without an effect estimate or null claim; independently
    ↳ retained
    supplementary components remain scoped.'
- kind: restriction
  condition: state(atom-000007) == "partial"
  says: 'Psychiatric service use and related recorded harms: only the named
    available components/windows and valid intervals may be interpreted.
    Publish their individual directions, exact missing reasons and
    ↳ uncertainty
    limits. Missing one component is not negative evidence about another.'
- kind: supplementary
  condition: state(atom-000007) == "higher"
  says: 'Psychiatric service use and related recorded harms: report the
    registered higher descriptive contrast(s), with exact time, target,
    units and pointwise intervals. This concerns recorded group patterns;
    it does not establish causal benefit or harm. All
    ↳ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000007) == "lower"
  says: 'Psychiatric service use and related recorded harms: report the
    registered lower descriptive contrast(s), with exact time, target, units
    and pointwise intervals. This concerns recorded group patterns; it does
    not establish causal benefit or harm. All measurement/attribution limits
    and any opposed or unavailable registered sensitivities must accompany
    this wording.'
- kind: supplementary
  condition: state(atom-000007) == "discordant"
  says: 'Psychiatric service use and related recorded harms: principal
    ↳ components
    have opposing descriptive directions. State both with their units and
    intervals; no uniform benefit, harm or average score follows.'
- kind: supplementary
  condition: state(atom-000007) == "otherwise"
  says: 'Psychiatric service use and related recorded harms: report
    ↳ estimates/components
    where valid and unresolved directions where intervals touch/span zero
    or mapping evidence remains ambiguous. Unresolved is not equivalence,
    insignificance, a weak causal first stage or no clinical importance.'
- kind: restriction
  condition: terminal(atom-000007) == "no_result"
  says: 'Psychiatric service use and related recorded harms: execution did
    not yield a scientific result. Publish no_result and exact reason,
    ↳ without
    substituting a null. Other independently measurable experiments remain
    governed by their own activation and evidence.'
- kind: restriction
  condition: state(atom-000008) == "data_gap"
  says: 'Cumulative all-cause domestic-record mortality: no complete
    ↳ principal
    endpoint is available. Describe the evidenced source/phenotype boundary
    without an effect estimate or null claim; independently retained
    ↳ supplementary

```

```

    components remain scoped.'
- kind: restriction
  condition: state(atom-000008) == "partial"
  says: 'Cumulative all-cause domestic-record mortality: only the named
    available components/windows and valid intervals may be interpreted.
    Publish their individual directions, exact missing reasons and
    ↪ uncertainty
    limits. Missing one component is not negative evidence about another.'
- kind: supplementary
  condition: state(atom-000008) == "higher"
  says: 'Cumulative all-cause domestic-record mortality: report the
    ↪ registered
    higher descriptive contrast(s), with exact time, target, units and
    ↪ pointwise
    intervals. This concerns recorded group patterns; it does not establish
    causal benefit or harm. All measurement/attribution limits and any
    ↪ opposed
    or unavailable registered sensitivities must accompany this wording.'
- kind: supplementary
  condition: state(atom-000008) == "lower"
  says: 'Cumulative all-cause domestic-record mortality: report the
    ↪ registered
    lower descriptive contrast(s), with exact time, target, units and
    ↪ pointwise
    intervals. This concerns recorded group patterns; it does not establish
    causal benefit or harm. All measurement/attribution limits and any
    ↪ opposed
    or unavailable registered sensitivities must accompany this wording.'
- kind: supplementary
  condition: state(atom-000008) == "otherwise"
  says: 'Cumulative all-cause domestic-record mortality: report
    ↪ estimates/components
    where valid and unresolved directions where intervals touch/span zero
    or mapping evidence remains ambiguous. Unresolved is not equivalence,
    insignificance, a weak causal first stage or no clinical importance.'
- kind: restriction
  condition: terminal(atom-000008) == "no_result"
  says: 'Cumulative all-cause domestic-record mortality: execution did not
    yield a scientific result. Publish no_result and exact reason, without
    substituting a null. Other independently measurable experiments remain
    governed by their own activation and evidence.'
- kind: restriction
  condition: state(atom-000009) == "data_gap"
  says: 'Complications, reinterventions and operation-clock safety: no
    ↪ complete
    principal endpoint is available. Describe the evidenced source/phenotype
    boundary without an effect estimate or null claim; independently
    ↪ retained
    supplementary components remain scoped.'
- kind: restriction
  condition: state(atom-000009) == "partial"
  says: 'Complications, reinterventions and operation-clock safety: only
    the named available components/windows and valid intervals may be
    ↪ interpreted.
    Publish their individual directions, exact missing reasons and
    ↪ uncertainty
    limits. Missing one component is not negative evidence about another.'
- kind: supplementary
  condition: state(atom-000009) == "higher"
  says: 'Complications, reinterventions and operation-clock safety: report

```

```

    the registered higher descriptive contrast(s), with exact time, target,
    units and pointwise intervals. This concerns recorded group patterns;
    it does not establish causal benefit or harm. All
    ↪ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000009) == "lower"
  says: 'Complications, reinterventions and operation-clock safety: report
    the registered lower descriptive contrast(s), with exact time, target,
    units and pointwise intervals. This concerns recorded group patterns;
    it does not establish causal benefit or harm. All
    ↪ measurement/attribution
    limits and any opposed or unavailable registered sensitivities must
    accompany this wording.'
- kind: supplementary
  condition: state(atom-000009) == "discordant"
  says: 'Complications, reinterventions and operation-clock safety:
    ↪ principal
    components have opposing descriptive directions. State both with their
    units and intervals; no uniform benefit, harm or average score follows.'
- kind: supplementary
  condition: state(atom-000009) == "otherwise"
  says: 'Complications, reinterventions and operation-clock safety: report
    estimates/components where valid and unresolved directions where
    ↪ intervals
    touch/span zero or mapping evidence remains ambiguous. Unresolved is
    not equivalence, insignificance, a weak causal first stage or no
    ↪ clinical
    importance.'
- kind: restriction
  condition: terminal(atom-000009) == "no_result"
  says: 'Complications, reinterventions and operation-clock safety:
    ↪ execution
    did not yield a scientific result. Publish no_result and exact reason,
    without substituting a null. Other independently measurable experiments
    remain governed by their own activation and evidence.'
- kind: residual
  condition: 'TRUE'
  says: 'Report every remaining pending, not_activated, suppressed,
    ↪ unresolved
    or operational component and its predicate/reason. Rules compose:
    ↪ unconditional/scoped
    restrictions first, then compatible primary and supplementary claims.
    Partial-state restrictions permit retained component narration but never
    a uniform summary. No remainder is assigned a favorable interpretation.'
```

The payload above and the member Atom registrations are the scientific authorities. The manifest and any later compiled graph are indexes/views.

Current interpretation

All Atoms are registered and pending; no empirical experimental findings exist. Public documentation motivates the registered identification boundary. Draft status in the manifest means scientific acceptance has not occurred.

atom-000001: Policy identification

SCOPE AND TARGET This source-evidence experiment asks whether the clinical-group allocation effect in identification.md I1 can be estimated. Population is the intended pre-anticipation U/C risk set, ages 25-59 in January 2011, not a recipient sample. Time zero, strict BMI bands, severity, clinical suitability and later policy potential-outcome paths are exactly I1-I3. Unit of this audit is a scientific predicate and its evidence, not an individual record. No register values are loaded. Inferential status is an identification boundary, not a data analysis or independently accepted causal study. **ORDERED PROCEDURE** 1. Read the normalized brief's topic_prompt directly, the data boundary and public sources recorded in literature.md/evidence. Create evidence-matrix.csv, one row for announcement, circulation, national start, lower/upper age, BMI bands, every qualifying condition, clinical suitability, grandfathering, each region, concurrent changes, later regime and each alternative measurement source. Columns: predicate, source_url, document_date, locator, access_level, finding, evidence_status, implication. These documentary fields may be filled from sources; they are not empirical result slots. 2. Use the primary circular for exact eligibility, contemporary Rigsrevisionen for chronology, and source-date-specific regional records for corroboration. Retain January/July 2011 conflict. First public announcement, complete transition rules and three regions remain unresolved. Do not impute identical implementation, infer exemptions or treat procurement as adoption. Keep the 2008 age change/free-choice interruption and 2011 specialty plan in the no-policy comparison assessment. 3. Evaluate policy-time strict BMI, the 40-50 band, qualifying severity, failed conservative therapy, suitability and contraindication assessment against D1 source fields. DE660D is a historical category valid through March 2010; MFR BMI is pregnancy-associated history; later result/survey fields do not fill pre-reform assessment. Do not import the clinical bariatric register, GP charts, a validation cohort or population BMI distribution. Do not treat documentation of a hypothetical validation test as evidence that it exists. No statistical classifier is trained. 4. Evaluate whether any already evidenced comparison supplies the intended no-P clinical-group trajectory while both groups face the national package and later changes. Record the capacity spillover and clinical-risk progression arguments. This contract supplies no defensible counterfactual restriction. No pretrend p-value, future first stage, regression adjustment or age widening can overwrite that judgment. 5. Register no positive causal branch in this version. The publicly evidenced missing constructs and unsupported comparator meet not_identified; adjudication remains a future recorded audit result, not an invented outcome. If retrieval itself fails operationally, report no_result; if evidence remains ambiguous use otherwise. New evidence requires a separately reviewed revision; do not retry/rewrite this Atom at runtime. 6. For each intended outcome family write causal-targets.csv with the I1 target, metric, clock/horizon, blank estimate/lower/upper, status not_identified and the specific prerequisite. With no_result audit execution use no_result, retaining the I1 prohibition. Report audit status in status.json. No p-values, power estimate, inferential sampling interval or SESOI applies to this logical-source judgment. **OUTPUTS AND TESTS** results/atom-000001/evidence-matrix.csv;

status.json; causal-targets.csv. Figure 1 and paper slot identification use these outputs. Test a complete institutional calendar with absent current BMI: it must remain not_identified. Test conflicting July/January plus independently missing clinical assessments: missing indispensable evidence takes priority. Test a timeout: no_result, not a null. Test a hypothetical large first stage: it is not an input to this judgment and cannot unlock anything. CLAIMS The intended effect remains unanswered; broader-population policy ITTs are not universally impossible, but none is defended here. No result of another Atom promotes this registration to a causal success. Scope of the boundary is this mapped clinical-group design, not every allowed Danish register or every possible future design.

Complete registration fields

```
id: atom-000001
topic: Policy identification
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: Can the 2011 allocation change and the intended clinical-group
    counterfactual support a long-term policy ITT within the allowed evidence?
  rationale: One consequential shared identification judgment integrates
    ↪ institutional
      assignment, actual eligibility constructs and the no-policy comparison.
      Documentary lookups are internal evidence, not separate experiments. The
      judgment constrains every causal claim, independently of whether recorded
      health can be described.
  assumption: The referenced public schema supports only documented field
    meanings; empirical feasibility and identifying variation are not
    ↪ inferred.
      The causal boundary in prereg/identification.md I1-I3 applies under every
      local result.
  target_strength: descriptive
  target_shape: comparison
  ratings:
    importance: 5
    novelty: 2
    feasibility: 2
    data_advantage: 3
    informativeness: 0.5
  tables:
    - MFR
    - LPR_DIAG
    - LPR_ADM
    - LPR_A_RESULTATER
    - MFR_MOR_RESULTATER
    - SILCP
    - BEF
  activation: 'TRUE'
  verdicts:
    - key: not_identified
```

region: At least one indispensable intended eligibility construct or the intended long-term counterfactual is demonstrably unsupported by the frozen mapped evidence; this takes precedence over unresolved subsidiary chronology.

says: The proposed clinical-group causal ITT is not identified in this contract. It is not a statistical null, a failed runtime mount, or

- success
- of a descriptive replacement.

- key: otherwise

region: otherwise

says: Audit evidence is unresolved. No causal estimator or positive

- eligibility
- state is authorized; report the precise unresolved predicates.

protocol: |-

SCOPE AND TARGET

This source-evidence experiment asks whether the clinical-group

- allocation effect in identification.md I1 can be estimated.
- Population is the intended pre-anticipation U/C risk set, ages 25-59
- in January 2011, not a recipient sample. Time zero, strict BMI bands,
- severity, clinical suitability and later policy potential-outcome
- paths are exactly I1-I3. Unit of this audit is a scientific predicate
- and its evidence, not an individual record. No register values are
- loaded. Inferential status is an identification boundary, not a data
- analysis or independently accepted causal study.

ORDERED PROCEDURE

1. Read the normalized brief's topic_prompt directly, the data boundary
 - and public sources recorded in literature.md/evidence. Create
 - evidence-matrix.csv, one row for announcement, circulation, national
 - start, lower/upper age, BMI bands, every qualifying condition,
 - clinical suitability, grandfathering, each region, concurrent
 - changes, later regime and each alternative measurement source.
 - Columns: predicate, source_url, document_date, locator, access_level,
 - finding, evidence_status, implication. These documentary fields may
 - be filled from sources; they are not empirical result slots.
2. Use the primary circular for exact eligibility, contemporary
 - Rigsrevisionen for chronology, and source-date-specific regional
 - records for corroboration. Retain January/July 2011 conflict. First
 - public announcement, complete transition rules and three regions
 - remain unresolved. Do not impute identical implementation, infer
 - exemptions or treat procurement as adoption. Keep the 2008 age
 - change/free-choice interruption and 2011 specialty plan in the
 - no-policy comparison assessment.
3. Evaluate policy-time strict BMI, the 40-50 band, qualifying severity,
 - failed conservative therapy, suitability and contraindication
 - assessment against D1 source fields. DE660D is a historical category
 - valid through March 2010; MFR BMI is pregnancy-associated history;
 - later result/survey fields do not fill pre-reform assessment. Do not
 - import the clinical bariatric register, GP charts, a validation
 - cohort or population BMI distribution. Do not treat documentation of
 - a hypothetical validation test as evidence that it exists. No
 - statistical classifier is trained.
4. Evaluate whether any already evidenced comparison supplies the intended no-P clinical-group trajectory while both groups face the national
 - package and later changes. Record the capacity spillover and clinical
 - -risk progression arguments. This contract supplies no defensible
 - counterfactual restriction. No pretrend p-value, future first stage,
 - regression adjustment or age widening can overwrite that judgment.

5. Register no positive causal branch in this version. The publicly
 ↳ evidenced missing constructs and unsupported comparator meet
 ↳ not_identified; adjudication remains a future recorded audit result,
 ↳ not an invented outcome. If retrieval itself fails operationally,
 ↳ report no_result; if evidence remains ambiguous use otherwise. New
 ↳ evidence requires a separately reviewed revision; do not
 ↳ retry/rewrite this Atom at runtime.

6. For each intended outcome family write causal-targets.csv with the I1
 ↳ target, metric, clock/horizon, blank estimate/lower/upper, status
 ↳ not_identified and the specific prerequisite. With no_result audit
 ↳ execution use no_result, retaining the I1 prohibition. Report audit
 ↳ status in status.json. No p-values, power estimate, inferential
 ↳ sampling interval or SESOI applies to this logical-source judgment.

OUTPUTS AND TESTS

results/atom-000001/evidence-matrix.csv; status.json; causal-targets.csv.

↳ Figure 1 and paper slot identification use these outputs. Test a
 ↳ complete institutional calendar with absent current BMI: it must
 ↳ remain not_identified. Test conflicting July/January plus
 ↳ independently missing clinical assessments: missing indispensable
 ↳ evidence takes priority. Test a timeout: no_result, not a null. Test
 ↳ a hypothetical large first stage: it is not an input to this judgment
 ↳ and cannot unlock anything.

CLAIMS

The intended effect remains unanswered; broader-population policy ITTs
 ↳ are not universally impossible, but none is defended here. No result
 ↳ of another Atom promotes this registration to a causal success. Scope
 ↳ of the boundary is this mapped clinical-group design, not every
 ↳ allowed Danish register or every possible future design.

Registered scientific unit

One consequential shared identification judgment integrates institutional assignment, actual eligibility constructs and the no-policy comparison. Documentary lookups are internal evidence, not separate experiments. The judgment constrains every causal claim, independently of whether recorded health can be described.

All empirical quantities and runtime local states are pending. The intended importance is high; novelty and causal feasibility are limited by the evidence contract. These design ratings are not observed evidence scores.

Reference implementation

Entry point and supported/unresolved components for atom-000001: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000002: Historical clinical population

POPULATION AND SEMANTICS Implement D2 verbatim: 1 January 2007 enrollment; age 25-59 at 1 January 2011 determined by DOB; DE660D main/secondary hospital contact starting in 2005-2006; alive and resident at enrollment; continuous observed residence 2003-2006. Do not select subsequent surgeries, pregnancies, referrals, survivor status or later diseases. Death at enrollment excludes a person if positively documented in baseline population status; later DOD reconciliation is a downstream vital-data restriction, not a changed H definition. FIELDS AND

CONSTRUCTION Use only D1 core BEF, VNDS, LPR_ADM and LPR_DIAG fields. Retrieve BEF immediately surrounding enrollment and quarterly residence anchors 2003-2006; resolve snapshot reference dates explicitly, never assume a calendar filename equals January 1. VNDS direction labels must be mapped from official definitions; a table without verified historical events is not continuous residence. Date-valid DE660D is selected via a diagnosis semi-join to unique source RECNUM, then unique persons. Require one DOB and one baseline municipality/region per person. Do not aggregate duplicate contact diagnoses into multiple people. ORDERED PSEUDOCODE 1. Validate allowed delivery, Danish coding labels and stated historical dates. Resolve A/B diagnosis roles before applying the code. If a delivered source is absent, evidenced data_gap; if the process crashes before resolution, no_result. 2. Create one baseline population row per PNR and trace excluded missing DOB/residence, ages outside band, interrupted prehistory and no dated DE660D. If duplicated snapshots disagree on a core field, seek only documented version precedence; absent such precedence stop that core construction. No imputed age/BMI or hospital-to-population fuzzy matching. 3. Build H with exactly the above rules. Compute R from the frozen D2 recorded-condition list in 2003-2006. Store individual history only under governed intermediate storage. Build ALL/R0/R1 baseline denominators; neither group is labeled clinically eligible. Report sex, age (25-34,35-44,45-59 at 2011), region and pre-2007 contact count categories (1,2-4,5+) as orienting descriptions. These are not alternative cohorts. 4. If H is nonempty and core assertions hold, historical_ready even if R0 or R1 is empty or optional LMDB/operations are unavailable. Write that group's N=0 only as a verified denominator, then mark group-specific rates/contrasts data_gap; retain ALL. Do not fit a propensity model or use standardized balance to certify exchangeability. No confirmatory tests, sampling inference or equivalence margin are needed for this finite-source construction. 5. Save results/atom-000002/cohort-flow.csv (step,reason,n,status), baseline-summary.csv (variable,category,group,n,denominator_n,status,reason), denominator-status.csv (group,status,reason), diagnostics.json and status.json. Store H pointer/hash privately; never put PNR or person rows in the World. All output counts are pending and subject to disclosure. 6. Diabetes T/F/U definitions are not executed as a gating part of this Atom. Each using experiment runs the exact shared rules locally with scoped sources. Failures in diabetes or drugs must not turn whole-H outcomes off. SYNTHETIC CHECKS Multiple same-contact DE660D records yield one H member; a 2012 obesity record cannot enroll anyone; BMI category 40+ cannot assign policy-time BMI>40 and<=50; residence interrupted in 2004 excludes; R1 can include recorded hypertension without establishing refractory disease; missing LMDB leaves historical_ready; empty R1 leaves ALL descriptions lawful. CONSEQUENCES historical_ready activates every independently measurable empirical module. data_gap or otherwise leaves them not_activated and their intended causal scope unanswered. no_result has no unsupported reconstruction bypass; without H no downstream denominator exists. This is a genuine shared prerequisite, unlike optional disease or procedure sources. No claim about all adults with severe obesity, policy exposure, selection-free follow-up or future sample size is licensed.

Complete registration fields

```
id: atom-000002
topic: Historical clinical population
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: Can a pretreatment historically coded severe-obesity population
    and its recorded clinical groups be followed without future-treatment
    selection?
  rationale: This is a shared measurement experiment about the meaning and
    reproducibility of the historical clinical denominator. It supplies H
    and R to independent health questions, but never supplies policy-time
    eligibility. Diabetes and medication availability are deliberately not
    global gates.
  assumption: The referenced public schema supports only documented field
    meanings; empirical feasibility and identifying variation are not
    ↪ inferred.
    The causal boundary in prereg/identification.md I1-I3 applies under every
    local result.
  target_strength: descriptive
  target_shape: comparison
  ratings:
    importance: 5
    novelty: 2
    feasibility: 2
    data_advantage: 3
    informativeness: 0.5
  tables:
    - BEF
    - VNDS
    - LPR_ADM
    - LPR_DIAG
  activation: 'TRUE'
  verdicts:
    - key: data_gap
      region: Verified absence of a required core field, label mapping,
        ↪ continuous-residence
        reconstruction or unresolvable core-key contradiction prevents the D2
        cohort; or the verified eligible historical H count is zero.
      says: No H-denominator analysis is available; empty H is an empirical
        population boundary, not no policy effect.
    - key: historical_ready
      region: The D2 core keys, coding, residence and time-zero rules are
        ↪ resolved,
        H has at least one member, and a unique frozen person table and R are
        constructed; this is only historical validity.
      says: H can support scoped descriptions. Policy eligibility remains
        ↪ unmeasured.
        Empty R cells block only group contrasts, not ALL descriptions.
    - key: otherwise
      region: otherwise
      says: Cohort evidence is unresolved; dependent empirical modules remain
```

not_activated until a realized allowed state, with no
 ↳ missing-evidence-to-zero
 substitution.

protocol: |-

POPULATION AND SEMANTICS

Implement D2 verbatim: 1 January 2007 enrollment; age 25-59 at 1 January
 ↳ 2011 determined by DOB; DE660D main/secondary hospital contact
 ↳ starting in 2005-2006; alive and resident at enrollment; continuous
 ↳ observed residence 2003-2006. Do not select subsequent surgeries,
 ↳ pregnancies, referrals, survivor status or later diseases. Death at
 ↳ enrollment excludes a person if positively documented in baseline
 ↳ population status; later DOD reconciliation is a downstream
 ↳ vital-data restriction, not a changed H definition.

FIELDS AND CONSTRUCTION

Use only D1 core BEF, VNDS, LPR_ADM and LPR_DIAG fields. Retrieve BEF
 ↳ immediately surrounding enrollment and quarterly residence anchors
 ↳ 2003-2006; resolve snapshot reference dates explicitly, never assume
 ↳ a calendar filename equals January 1. VNDS direction labels must be
 ↳ mapped from official definitions; a table without verified historical
 ↳ events is not continuous residence. Date-valid DE660D is selected via
 ↳ a diagnosis semi-join to unique source RECNUM, then unique persons.
 ↳ Require one DOB and one baseline municipality/region per person. Do
 ↳ not aggregate duplicate contact diagnoses into multiple people.

ORDERED PSEUDOCODE

1. Validate allowed delivery, Danish coding labels and stated historical
 ↳ dates. Resolve A/B diagnosis roles before applying the code. If a
 ↳ delivered source is absent, evidenced data_gap; if the process
 ↳ crashes before resolution, no_result.
2. Create one baseline population row per PNR and trace excluded missing
 ↳ DOB/residence, ages outside band, interrupted prehistory and no dated
 ↳ DE660D. If duplicated snapshots disagree on a core field, seek only
 ↳ documented version precedence; absent such precedence stop that core
 ↳ construction. No imputed age/BMI or hospital-to-population fuzzy
 ↳ matching.
3. Build H with exactly the above rules. Compute R from the frozen D2
 ↳ recorded-condition list in 2003-2006. Store individual history only
 ↳ under governed intermediate storage. Build ALL/R0/R1 baseline
 ↳ denominators; neither group is labeled clinically eligible. Report
 ↳ sex, age (25-34,35-44,45-59 at 2011), region and pre-2007 contact
 ↳ count categories (1,2-4,5+) as orienting descriptions. These are not
 ↳ alternative cohorts.
4. If H is nonempty and core assertions hold, historical_ready even if R0
 ↳ or R1 is empty or optional LMDB/operations are unavailable. Write
 ↳ that group's N=0 only as a verified denominator, then mark
 ↳ group-specific rates/contrasts data_gap; retain ALL. Do not fit a
 ↳ propensity model or use standardized balance to certify
 ↳ exchangeability. No confirmatory tests, sampling inference or
 ↳ equivalence margin are needed for this finite-source construction.
5. Save results/atom-000002/cohort-flow.csv (step,reason,n,status),
 ↳ baseline-summary.csv (variable,category,group,n,denominator_n,status,
 ↳ reason), denominator-status.csv (group,status,reason),
 ↳ diagnostics.json and status.json. Store H pointer/hash privately;
 ↳ never put PNR or person rows in the World. All output counts are
 ↳ pending and subject to disclosure.
6. Diabetes T/F/U definitions are not executed as a gating part of this
 ↳ Atom. Each using experiment runs the exact shared rules locally with
 ↳ scoped sources. Failures in diabetes or drugs must not turn whole-H
 ↳ outcomes off.

SYNTHETIC CHECKS

Multiple same-contact DE660D records yield one H member; a 2012 obesity
 ↪ record cannot enroll anyone; BMI category 40+ cannot assign
 ↪ policy-time BMI>40 and<=50; residence interrupted in 2004 excludes;
 ↪ R1 can include recorded hypertension without establishing refractory
 ↪ disease; missing LMDB leaves historical_ready; empty R1 leaves ALL
 ↪ descriptions lawful.
 CONSEQUENCES
 historical_ready activates every independently measurable empirical modul
 ↪ e. data_gap or otherwise leaves them not_activated and their intended
 ↪ causal scope unanswered. no_result has no unsupported reconstruction
 ↪ bypass: without H no downstream denominator exists. This is a genuine
 ↪ shared prerequisite, unlike optional disease or procedure sources. No
 ↪ claim about all adults with severe obesity, policy exposure,
 ↪ selection-free follow-up or future sample size is licensed.

Registered scientific unit

This is a shared measurement experiment about the meaning and reproducibility of the historical clinical denominator. It supplies H and R to independent health questions, but never supplies policy-time eligibility. Diabetes and medication availability are deliberately not global gates.

All empirical quantities and runtime local states are pending. The intended importance is high; novelty and causal feasibility are limited by the evidence contract. These design ratings are not observed evidence scores.

Reference implementation

Entry point and supported/unresolved components for atom-000002: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000003: Recorded surgical access

IMPLEMENTATION AND REPORTING CONTRACT Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as incorporated definitions, not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and duplicate counts in diagnostics.json. Units, inclusion, competing events and original denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent m values use original-group N and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original N. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no p-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions

with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but interval_unavailable; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal no_result, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component no_result; apply the ordered partial-state rule. Evidence of a missing construct is data_gap. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded data_gap. No software success upgrades causal identification. Every runtime output lives under results/atom-000003/. Write status.json, diagnostics.json, annual.csv (all registered years), periods.csv (all registered periods), contrasts.csv (all registered principal metrics), causal-targets.csv (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

UNIT-SPECIFIC PROTOCOL Population is frozen H and its R0/R1 groups; optional T/F strata use D2 independently, with U retained in H. No future surgery selection. The principal metric stable_operations is distinct surgery days using D3's exact stable code list, per 1000 original-person calendar years. principal unit = operations_per_1000_original_person_years. Stable means named code-family availability, not invariant surgical treatment versions or complete all-bariatric ascertainment. Count all captured surgery days after entry, including repeats. Separate metric first_recorded_operation_cumulative measures at least one qualifying surgery day since 2007 before death/emigration per 1000 baseline people; never label first-ever surgery. 1. Run D5 and death/emigration checks for H without requiring LMDB. For every LPR2 operation join RECNUM many-to-one to its source ADM; assert all selected procedures map to one person. For private/public overlapping reports deduplicate PNR/date/code and then surgery day. Show public-recorded, private-recorded and union scope counts; unknown cross-source person linkage blocks the union, not the public-only component. Public-only scope may be described, but all-year scope must be consistent for a contrast. 2. Resolve LPR3 contact/pathway procedure mapping per D1. Flag procedure-only records and do not discard them just because contact is null. If payer link is absent, retain surgery capture and record financing unknown. Missing private self-funded reports cannot be diagnosed away by counts, a table name or a stable series. No total-access label or substitution percentage is produced. 3. Compute annual/period stable_operations for H, R0/R1 and ALL; compute first_recorded_operation_cumulative at the fixed end years. Emit exact expected rows for unavailable windows. Separate sleeve_2013plus, endoscopic_sleeve_2018plus and reversal are not added to the historical stable first-stage series. Sleeve code-introduction dates break comparable total procedure access; no historical zero is imputed. 4. Resolve T/F membership and repeat both metrics for T and F if possible. A full-H access pattern cannot stand in for access in either diabetes population. Missing LMDB disables F and T's medication-dependent

characterization only, not H or hospital-defined T access. This is a prespecified component branch, never chosen by observed access direction. 5. Compute the one principal H descriptive change contrast under I4-I5. Display fixed yearly group gaps and pre-year profiles 2007-2009; 2008/free-choice disturbances and 2010 anticipation are labeled. Do not select a different pre-period, fit a causal interrupted time series, search a cutoff or claim parallel trends. Compare cumulative first post-entry operations to reveal catch-up, with mortality/emigration fractions beside it. 6. Optional funding descriptions require authoritative historical payer code meanings and one consistent payer per procedure/date. If unresolved, financing.csv has status data_gap and exact reason; no public/private ownership shortcut. No financing gap erases surgery results. Supplementary procedure and stratum results are not part of the local principal sign partition but have all directions/scopes in their tables. 7. Write additional capture.csv (year,source,metric,status,reason,duplicate_rule) and financing.csv; expose the complete surgery-day ledger only privately for safety if valid. All causal first-stage rows remain not_identified. No observed weak or strong policy first stage is declared; a weak policy first stage would be fatal in a newly identified design, not a statistic that repairs this one. CHECKS AND INTERPRETATION Synthetic: one contact with two diagnoses and two procedures does not yield four operations; a contactless pathway operation maps once; same-day private/public reports yield one day; absent sleeve before 2013 yields unavailable rather than zero; absent payer and F stratum leave H access; large captured access contrasts cannot turn atom-000001 causal. Figure 2 consumes annual.csv, stable_operations H only; optional strata and cumulative access enter Table 2. Paper access-state prose reports complete/partial/directional/unresolved outcomes with a descriptive ceiling.

Complete registration fields

```
id: atom-000003
topic: Recorded surgical access
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: How did captured bariatric-operation access evolve across recorded
    baseline clinical need, including the diabetes strata?
  rationale: Surgical access is the substantive intermediate allocation
    ↪ question.
    Procedure capture, private reporting, payer checks, catch-up and
    ↪ stratum-specific
    access remain one coherent experiment. It cannot become a causal first
    stage while eligibility and counterfactual identification fail.
  assumption: The referenced public schema supports only documented field
    meanings; empirical feasibility and identifying variation are not
    ↪ inferred.
    The causal boundary in prereg/identification.md I1-I3 applies under every
    local result.
```

```

target_strength: associational
target_shape: comparison
ratings:
  importance: 5
  novelty: 2
  feasibility: 2
  data_advantage: 3
  informativeness: 0.5
tables:
- BEF
- VNDS
- DOD
- LPR_ADM
- LPR_DIAG
- LPR_SKSOPR
- PRIV_ADM
- PRIV_SKSOPR
- PRIV_FRITVALG
- LMDB
- LPR_A_KONTAKT
- LPR_A_FORLOEB
- LPR_A_PROCREGISTRERING
- LPR_A_BETALINGSOPLYSNINGER
activation: state(atom-000002) == "historical_ready"
verdicts:
- key: data_gap
  region: No principal stable-operation component for any H group/window
    is scientifically estimable because of documented source/definition
    gaps.
  says: Captured access cannot be described in this contract; no
    ↪ first-stage-null
    claim follows.
- key: partial
  region: At least one principal H operation component is valid but another
    registered principal H window/group/interval or a required contrast
    is unavailable.
  says: Report each retained operation result and exact missing component.
    Optional payer/sleeve/F/T gaps do not trigger a broad failure.
- key: lower
  region: All principal H components and fixed long-minus-pre R0-minus-R1
    contrast have valid scope/uncertainty, and its upper limit is <0.
  says: The recorded access gap decreased descriptively; no causal loss
    of access or surgery mechanism is established.
- key: higher
  region: All principal H components and fixed contrast have valid
    ↪ scope/uncertainty,
    and its lower limit is >0.
  says: The recorded access gap increased descriptively; clinical policy
    exposure is not identified.
- key: otherwise
  region: otherwise
  says: Access differences are unresolved or span zero. This is neither
    equivalence nor a weak/strong causal first-stage judgment.
protocol: |-
  IMPLEMENTATION AND REPORTING CONTRACT

```

Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as
 ↳ incorporated definitions, not discretionary suggestions. Execute D5
 ↳ checks in their stated order. Projection is only the tables/fields
 ↳ named here and in the cited construction. No row is accessed at
 ↳ author stage. Freeze delivered field-label/code versions before
 ↳ counting. Record scope, source-date coverage, join cardinalities,
 ↳ contradictory records and duplicate counts in diagnostics.json.
 ↳ Units, inclusion, competing events and original denominators cannot
 ↳ change after viewing results.

Use exact period boundaries and domestic-record follow-up in I4/D3. Recur
 ↳ rent m values use original-group N and calendar length, not survivors
 ↳ or treated recipients. Cumulative fractions require complete interven
 ↳ ing event histories and use original N. All available outputs retain
 ↳ death/emigration counts and missing/suppressed statuses. No weighting
 ↳ , imputation, propensity matching, treatment-on-treated effect,
 ↳ hazard-ratio conversion or outcome-selected subgroup is authorized.

Use the municipality bootstrap, replicate-failure rules and pointwise des
 ↳ criptive interpretation in I5; no p-value or equivalence declaration.
 ↳ Recompute all summaries and group differences in each cluster draw. T
 ↳ here are no estimated nuisance models. Publish all component-specific
 ↳ directions with exact intervals; an aggregate local key cannot
 ↳ replace the component table. Fewer than 30 group municipalities or
 ↳ >1% undefined replicates leaves valid point descriptions but
 ↳ interval_unavailable; do not force a directional result.

Operational extraction/computation failure with no completed scientific
 ↳ output is terminal no_result, not an Atom local statistical state. If
 ↳ at least one component is scientifically complete, preserve it and
 ↳ mark each failed component no_result; apply the ordered partial-state
 ↳ rule. Evidence of a missing construct is data_gap. Unknown unresolved
 ↳ semantics without such evidence is otherwise. A timeout cannot be
 ↳ coded data_gap. No software success upgrades causal identification.

Every runtime output lives under results/atom-000003/. Write status.json,
 ↳ diagnostics.json, annual.csv (all registered years), periods.csv (all
 ↳ registered periods), contrasts.csv (all registered principal metrics)
 ↳ , causal-targets.csv (blank causal quantities, exact not_identified
 ↳ reason), and a public-safe README describing units, source/version
 ↳ and restrictions. All column contracts are D4. Persist any additional
 ↳ registered components in components.csv. No outputs exist at registra
 ↳ tion. Figure and manuscript bindings are derivative presentations.
 ↳ Synthetic boundary-date/key tests are D5 plus the unit-specific cases
 ↳ below; numerical fixtures must never become paper estimates.

UNIT-SPECIFIC PROTOCOL

Population is frozen H and its R0/R1 groups; optional T/F strata use D2
 ↳ independently, with U retained in H. No future surgery selection. The
 ↳ principal metric stable_operations is distinct surgery days using
 ↳ D3's exact stable code list, per 1000 original-person calendar years.
 ↳ principal unit = operations_per_1000_original_person_years. Stable
 ↳ means named code-family availability, not invariant surgical
 ↳ treatment versions or complete all-bariatric ascertainment. Count all
 ↳ captured surgery days after entry, including repeats. Separate metric
 ↳ first_recorded_operation_cumulative measures at least one qualifying
 ↳ surgery day since 2007 before death/emigration per 1000 baseline
 ↳ people; never label first-ever surgery.

1. Run D5 and death/emigration checks for H without requiring LMDB. For
 - every LPR2 operation join RECNUM many-to-one to its source ADM;
 - assert all selected procedures map to one person. For private/public
 - overlapping reports deduplicate PNR/date/code and then surgery day.
 - Show public-recorded, private-recorded and union scope counts;
 - unknown cross-source person linkage blocks the union, not the
 - public-only component. Public-only scope may be described, but
 - all-year scope must be consistent for a contrast.
2. Resolve LPR3 contact/pathway procedure mapping per D1. Flag
 - procedure-only records and do not discard them just because contact
 - is null. If payer link is absent, retain surgery capture and record
 - financing unknown. Missing private self-funded reports cannot be
 - diagnosed away by counts, a table name or a stable series. No
 - total-access label or substitution percentage is produced.
3. Compute annual/period stable_operations for H, R0/R1 and ALL; compute
 - first_recorded_operation_cumulative at the fixed end years. Emit exac
 - t expected rows for unavailable windows. Separate sleeve_2013plus,
 - endoscopic_sleeve_2018plus and reversal are not added to the historic
 - al stable first-stage series. Sleeve code-introduction dates break
 - comparable total procedure access; no historical zero is imputed.
4. Resolve T/F membership and repeat both metrics for T and F if
 - possible. A full-H access pattern cannot stand in for access in
 - either diabetes population. Missing LMDB disables F and T's
 - medication-dependent characterization only, not H or hospital-defined
 - T access. This is a prespecified component branch, never chosen by
 - observed access direction.
5. Compute the one principal H descriptive change contrast under I4-I5.
 - Display fixed yearly group gaps and pre-year profiles 2007-2009;
 - 2008/free-choice disturbances and 2010 anticipation are labeled. Do
 - not select a different pre-period, fit a causal interrupted time
 - series, search a cutoff or claim parallel trends. Compare cumulative
 - first post-entry operations to reveal catch-up, with
 - mortality/emigration fractions beside it.
6. Optional funding descriptions require authoritative historical payer
 - code meanings and one consistent payer per procedure/date. If
 - unresolved, financing.csv has status data_gap and exact reason; no
 - public/private ownership shortcut. No financing gap erases surgery
 - results. Supplementary procedure and stratum results are not part of
 - the local principal sign partition but have all directions/scopes in
 - their tables.
7. Write additional capture.csv (year,source,metric,status,reason,duplica
 - te_rule) and financing.csv; expose the complete surgery-day ledger
 - only privately for safety if valid. All causal first-stage rows
 - remain not_identified. No observed weak or strong policy first stage
 - is declared; a weak policy first stage would be fatal in a newly
 - identified design, not a statistic that repairs this one.

CHECKS AND INTERPRETATION

Synthetic: one contact with two diagnoses and two procedures does not

- yield four operations; a contactless pathway operation maps once;
- same-day private/public reports yield one day; absent sleeve before
- 2013 yields unavailable rather than zero; absent payer and F stratum
- leave H access; large captured access contrasts cannot turn
- atom-000001 causal. Figure 2 consumes annual.csv, stable_operations H
- only; optional strata and cumulative access enter Table 2. Paper
- access-state prose reports complete/partial/directional/unresolved
- outcomes with a descriptive ceiling.

Registered scientific unit

Surgical access is the substantive intermediate allocation question. Procedure capture, private reporting, payer checks, catch-up and stratum-specific access remain one coherent experiment. It cannot become a causal first stage while eligibility and counterfactual identification fail.

All empirical quantities and runtime local states are pending. The intended importance is high; novelty and causal feasibility are limited by the evidence contract. These design ratings are not observed evidence scores.

Reference implementation

Entry point and supported/unresolved components for `atom-000003`: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

`atom-000004`: Acute hospital burden

IMPLEMENTATION AND REPORTING CONTRACT Read `prereg/data-contract.md` D1-D5 and `prereg/identification.md` I4-I5 as incorporated definitions, not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and duplicate counts in `diagnostics.json`. Units, inclusion, competing events and original denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent `m` values use original-group `N` and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original `N`. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no `p`-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but `interval_unavailable`; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal `no_result`, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component `no_result`; apply the ordered partial-state rule. Evidence of a missing construct is `data_gap`. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded `data_gap`. No software success upgrades causal identification. Every runtime output lives under `results/atom-000004/`. Write `status.json`, `diagnostics.json`, `annual.csv` (all registered years), `periods.csv` (all registered periods), `contrasts.csv` (all registered principal metrics), `causal-targets.csv` (blank causal quantities, exact `not_identified`

reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS `acute_all` and `acute_cv`: two H change contrasts, each long (2016-2024) minus pre (2007-2009), R0 minus R1. Principal completeness requires annual H R0/R1 and fixed-period rows plus both contrasts. ALL and secondary decompositions are supplementary.

POPULATION, OUTCOMES AND TIME Use H, with R0/R1 and ALL, followed from entry under D3. Principal metrics `acute_all` and `acute_cv` use episodes per 1000 original-person calendar years. `acute_cv` is an acute inpatient episode with main discharge diagnosis in date-valid `DI21/DI22` (myocardial infarction) or `DI60/DI61/DI62/DI63/DI64*` (stroke). Count one episode when multiple codes occur. Heart failure `DI50*` is a separate supplementary `acute_hf` component. No mortality is folded into CV; death is analyzed by atom-000008. These broad hospital-coded definitions are not laboratory-confirmed disease or validated Danish eligibility. ORDERED IMPLEMENTATION 1. Implement D1 joins and D3 acute inpatient spell assembly. Verify coding of acute versus elective and inpatient versus emergency-only contacts in both eras, including the 2014 and 2019 breaks. Require unique contact-to-person and stay-to-person mapping. For main-diagnosis composites, attach diagnosis flags only after child-table reduction. Invalid CV code/role mapping blocks `acute_cv`, not `acute_all`. 2. Count an episode at its first qualifying acute admission date; all diagnoses in the merged episode can supply the cardiovascular main-diagnosis rule. Acute all-cause episodes retain operations and complications: surgery-driven admissions are not excluded to improve the health result. Elective-only index surgery is outside `acute_all` by definition, and index-stay safety is separately preserved in atom-000009. 3. Construct annual and fixed-period event counts and original N/L denominators. Report alive/resident days descriptively alongside original-person years without replacing the denominator. Periods that contain unharmonizable 2019 records are unavailable; pre-2019 valid rows remain. No deaths/emigrations are deleted from baseline N and no surviving-late cohort is constructed. 4. Compute the two principal fixed I4 change contrasts and cluster intervals jointly in the same resamples. heart-failure, MI-only and stroke-only metrics are supplementary decomposition, not extra discoveries or separately selected principal states. No sample/event-count claim is made in advance; very few or zero events must not yield a declared clinically small effect. A zero-event bootstrap with all identical estimates is `interval_unavailable` for directional adjudication, not proof of safety/equivalence. 5. Registered sensitivities: overlap/same-day episode merging instead of next-day merging; main-or-secondary CV diagnoses instead of main only; separate 2016-2018 and 2019-2024 long-era descriptions. These are always reported where measurable, never selected to replace the main outcome or long window. For each sensitivity contrast report direction and whether the principal interval direction is preserved, opposed, or unresolved: preserved only if both directions equal higher or both equal lower; opposed only if higher versus lower; otherwise unresolved. A missing sensitivity is unavailable. These judgments live in components.csv and do

not establish causal robustness. 6. Write `annual.csv`, `periods.csv`, `contrasts.csv` plus `components.csv` (definition=`principal/overlap_only/any_position/era_split`; metric and period explicit). Primary `acute_all` is the intended policy-health endpoint but its causal-targets.csv is not `_identified`. A lower observed `acute_all` gap can coexist with a higher CV gap or vice versa; label discordance as morbidity composition, not net welfare. SYNTHETIC CHECKS Transfers crossing year-end count at first admission once; duplicate diagnosis rows do not double CV; CV code failure leaves `acute_all`; an elective-only complication is absent from `acute_all` but retained in safety; death during admission retains the pre-death admission; absent post-2019 inpatient mapping yields explicit later-year status rows; rare-event all-zero replicates never establish equivalence. OUTPUT USE Figure 3 reads `acute_all` and `acute_cv` `annual.csv` rows in separate panels. Table 3 preserves heart failure, decompositions and sensitivity results. Paper hospital prose uses all local keys including mixed and partial states. No result is called a policy effect or a clinically validated safety/benefit conclusion.

Complete registration fields

```
id: atom-000004
topic: Acute hospital burden
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: How do all-cause acute admissions and serious cardiovascular acute
    admissions evolve across recorded baseline clinical need?
  rationale: 'This experiment evaluates clinically important acute morbidity
    and utilization jointly: cardiovascular episodes are an interpretable
    disease-specific component of the all-cause burden. Transfer rules, the
    inpatient mapping, rare-event precision and sensitivities belong with
    this question; cardiovascular results remain separately reported, never
    combined into an index.'
  assumption: Documented outcome fields may support a restricted
    ↪ domestic-record
    description after runtime validation. Neither historical R groups nor
    outcome trends establish policy eligibility or a no-policy counterfactual.
  target_strength: associational
  target_shape: temporal
  ratings:
    importance: 5
    novelty: 2
    feasibility: 2
    data_advantage: 3
    informativeness: 0.5
  tables:
    - BEF
    - VNDS
    - DOD
    - LPR_ADM
    - LPR_DIAG
    - LPR_A_KONTAKT
```

```

- LPR_A_DIAGNOSE
- LPR_A_SGHOPHOLD
activation: state(atom-000002) == "historical_ready"
verdicts:
- key: data_gap
  region: No principal component is scientifically estimable because its
    necessary population, source, phenotype or follow-up definition is
    ↪ demonstrably
    unavailable.
  says: This endpoint question reaches an evidenced measurement boundary;
    no clinical or policy null is inferred.
- key: partial
  region: At least one principal component is scientifically estimable,
    but at least one other principal component, required
    ↪ period/group/contrast
    or uncertainty interval is unavailable. Evaluate before sign regions.
  says: Retain each measurable component and its direction/interval; report
    every separate failure. No unavailable component erases another.
- key: discordant
  region: All principal contrasts have valid intervals and scope; at least
    one has lower>0 and at least one has upper<0.
  says: Principal components differ in descriptive direction; report them
    separately, with no average health score.
- key: higher
  region: All principal contrasts have valid intervals/scope and every lower
    limit is >0.
  says: All principal registered descriptive contrasts are higher; this
    is not a causal harm verdict.
- key: lower
  region: All principal contrasts have valid intervals/scope and every upper
    limit is <0.
  says: All principal registered descriptive contrasts are lower; this is
    not a causal benefit verdict.
- key: otherwise
  region: otherwise
  says: Evidence is unresolved, intervals touch/span zero, or components
    combine a resolved direction with an unresolved direction. Neither
    ↪ equivalence
    nor uniformity is established.
protocol: |-
IMPLEMENTATION AND REPORTING CONTRACT
Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as
↪ incorporated definitions, not discretionary suggestions. Execute D5
↪ checks in their stated order. Projection is only the tables/fields
↪ named here and in the cited construction. No row is accessed at
↪ author stage. Freeze delivered field-label/code versions before
↪ counting. Record scope, source-date coverage, join cardinalities,
↪ contradictory records and duplicate counts in diagnostics.json.
↪ Units, inclusion, competing events and original denominators cannot
↪ change after viewing results.
Use exact period boundaries and domestic-record follow-up in I4/D3. Recur
↪ rent m values use original-group N and calendar length, not survivors
↪ or treated recipients. Cumulative fractions require complete interven
↪ ing event histories and use original N. All available outputs retain
↪ death/emigration counts and missing/suppressed statuses. No weighting
↪ , imputation, propensity matching, treatment-on-treated effect,
↪ hazard-ratio conversion or outcome-selected subgroup is authorized.

```

Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no p-value or equivalence declaration.

- Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but interval_unavailable; do not force a directional result.

Operational extraction/computation failure with no completed scientific output is terminal no_result, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component no_result; apply the ordered partial-state rule. Evidence of a missing construct is data_gap. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded data_gap. No software success upgrades causal identification.

Every runtime output lives under results/atom-000004/. Write status.json, diagnostics.json, annual.csv (all registered years), periods.csv (all registered periods), contrasts.csv (all registered principal metrics), causal-targets.csv (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS

acute_all and acute_cv: two H change contrasts, each long (2016-2024)

- minus pre (2007-2009), R0 minus R1. Principal completeness requires annual H R0/R1 and fixed-period rows plus both contrasts. ALL and secondary decompositions are supplementary.

POPULATION, OUTCOMES AND TIME

Use H, with R0/R1 and ALL, followed from entry under D3. Principal metrics acute_all and acute_cv use episodes per 1000 original-person calendar years. acute_cv is an acute inpatient episode with main discharge diagnosis in date-valid DI21*/DI22* (myocardial infarction) or DI60*/DI61*/DI62*/DI63*/DI64* (stroke). Count one episode when multiple codes occur. Heart failure DI50* is a separate supplementary acute_hf component. No mortality is folded into CV; death is analyzed by atom-000008. These broad hospital-coded definitions are not laboratory-confirmed disease or validated Danish eligibility.

ORDERED IMPLEMENTATION

1. Implement D1 joins and D3 acute inpatient spell assembly. Verify
 - coding of acute versus elective and inpatient versus emergency-only contacts in both eras, including the 2014 and 2019 breaks. Require unique contact-to-person and stay-to-person mapping. For main-diagnosis composites, attach diagnosis flags only after child-table reduction.
 - Invalid CV code/role mapping blocks acute_cv, not acute_all.
2. Count an episode at its first qualifying acute admission date; all
 - diagnoses in the merged episode can supply the cardiovascular main-diagnosis rule. Acute all-cause episodes retain operations and complications: surgery-driven admissions are not excluded to improve the health result. Elective-only index surgery is outside acute_all by definition, and index-stay safety is separately preserved in atom-000009.

3. Construct annual and fixed-period event counts and original N/L
 - denominators. Report alive/resident days descriptively alongside
 - original-person years without replacing the denominator. Periods that
 - contain unharmonizable 2019 records are unavailable; pre-2019 valid
 - rows remain. No deaths/emigrations are deleted from baseline N and no
 - surviving-late cohort is constructed.
4. Compute the two principal fixed I4 change contrasts and cluster
 - intervals jointly in the same resamples. heart-failure, MI-only and
 - stroke-only metrics are supplementary decomposition, not extra
 - discoveries or separately selected principal states. No
 - sample/event-count claim is made in advance; very few or zero events
 - must not yield a declared clinically small effect. A zero-event
 - bootstrap with all identical estimates is interval_unavailable for
 - directional adjudication, not proof of safety/equivalence.
5. Registered sensitivities: overlap/same-day episode merging instead of
 - next-day merging; main-or-secondary CV diagnoses instead of main
 - only; separate 2016-2018 and 2019-2024 long-era descriptions. These
 - are always reported where measurable, never selected to replace the
 - main outcome or long window. For each sensitivity contrast report
 - direction and whether the principal interval direction is preserved,
 - opposed, or unresolved: preserved only if both directions equal higher
 - or both equal lower; opposed only if higher versus lower; otherwise
 - unresolved. A missing sensitivity is unavailable. These judgments
 - live in components.csv and do not establish causal robustness.
6. Write annual.csv, periods.csv, contrasts.csv plus components.csv
 - (definition=principal/overlap_only/any_position/era_split; metric and
 - period explicit). Primary acute_all is the intended policy-health
 - endpoint but its causal-targets.csv is not_identified. A lower
 - observed acute_all gap can coexist with a higher CV gap or vice
 - versa; label discordance as morbidity composition, not net welfare.

SYNTHETIC CHECKS

- Transfers crossing year-end count at first admission once; duplicate
- diagnosis rows do not double CV; CV code failure leaves acute_all; an
 - elective-only complication is absent from acute_all but retained in
 - safety; death during admission retains the pre-death admission;
 - absent post-2019 inpatient mapping yields explicit later-year status
 - rows; rare-event all-zero replicates never establish equivalence.

OUTPUT USE

- Figure 3 reads acute_all and acute_cv annual.csv rows in separate panels.
- Table 3 preserves heart failure, decompositions and sensitivity
 - results. Paper hospital prose uses all local keys including mixed and
 - partial states. No result is called a policy effect or a clinically
 - validated safety/benefit conclusion.

Registered scientific unit

This experiment evaluates clinically important acute morbidity and utilization jointly: cardiovascular episodes are an interpretable disease-specific component of the all-cause burden. Transfer rules, the inpatient mapping, rare-event precision and sensitivities belong with this question; cardiovascular results remain separately reported, never combined into an index.

Empirical results remain unfilled. Importance is high, but novelty and feasibility are limited by the failed causal identification. No study outcome is known.

Reference implementation

Entry point and supported/unresolved components for `atom-000004`: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000005: Recorded diabetes incidence

IMPLEMENTATION AND REPORTING CONTRACT Read `prereg/data-contract.md` D1-D5 and `prereg/identification.md` I4-I5 as incorporated definitions, not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and duplicate counts in `diagnostics.json`. Units, inclusion, competing events and original denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent `m` values use original-group `N` and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original `N`. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no `p`-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or $>1\%$ undefined replicates leaves valid point descriptions but `interval_unavailable`; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal `no_result`, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component `no_result`; apply the ordered partial-state rule. Evidence of a missing construct is `data_gap`. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded `data_gap`. No software success upgrades causal identification. Every runtime output lives under `results/atom-000005/`. Write `status.json`, `diagnostics.json`, `annual.csv` (all registered years), `periods.csv` (all registered periods), `contrasts.csv` (all registered principal metrics), `causal-targets.csv` (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in `components.csv`. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS One principal contrast: `t2_cumulative`, 2024 `R0-minus-R1` in `F`. Completeness requires the registered `F` cumulative history and principal contrast; drug-initiation and observation-process components remain independently reported supplements. No discordant Atom state is needed for this single principal endpoint.

POPULATION AND ESTIMAND Derive F locally using D2, with the complete 1996-2006 residence/hospital/pharmacy requirements. F is known only when all negative-history requirements can be checked. Do not substitute hospital-only absence when pharmacy history is missing. A DO241-only history is prevalent type-2 and cannot enter F; every DO24 code excludes F under this deliberately strict definition. Record exclusions for prior A10, gestational/uncertain/type-1 diabetes and incomplete residence separately. F is a subset fixed before anticipation, never selected for later surgery, pregnancy or survival. The principal metric $t2_cumulative$ is first recorded DE11/*DO241* after entry, before competing death/emigration and first type-1/other/uncertain diabetes event. Report cumulative events per 1000 original F persons at ends of 2009,2010,2011,2015,2024 and annually. The principal descriptive contrast is R0 minus R1 cumulative fraction by 2024. There is no subtraction of mechanically zero baseline incidence and no use of late diagnosis flow as a prevention verdict. ORDERED IMPLEMENTATION 1. Verify F and source-specific calendar coverage. For each person order all main/secondary diabetes records by date. Codes DE10/*DO240* indicate type 1; DE12-*DE14*, DO242/*DO243*/*DO245*/*DO249* or exact DO24 indicate other/uncertain diabetes and compete with definite type 2. DO244* after entry is gestational only: flag it and continue observation for later definite type 2. For simultaneous non-type-2 and type-2 records without resolvable order, assign uncertain competitor, not type 2. A later clarification does not retroactively move first-event type in the primary definition. 2. Positive A10 dispensing after baseline is recorded as new glucose-lowering treatment, not independently definite diabetes; metformin may treat PCOS. If a person's only postbaseline evidence is medication, they do not become a definite T2 event. Their treatment use is a separate cumulative drug_initiation component. This separates ascertainment from biological onset. 3. Build cumulative empirical subdistribution: $1000/N_Fr$ times number whose first qualifying T2 event occurs by the landmark and before the competing events. Death/emigration are observed competitors in this domestic-record target, not censoring weights. For each year report T2 events, competing death, emigration, other-diabetes events and still-no-record fraction; these sum to the appropriate original N except the explicitly noncompeting drug-use descriptor. 4. Compute one principal 2024 group difference with the I5 bootstrap. Nonfinite/degenerate intervals are unavailable. If an earlier year is missing, all later cumulative points requiring that history are unavailable; no restart at 2019 or removal of early cases. Earlier valid points remain partial evidence. 5. Prespecified ascertainment analyses within F: cumulative A10 initiation, first T2 diagnosis on inpatient versus outpatient contact, and annual all-cause hospital contact starts. They may show changes in care/recording but cannot certify biological onset or causal parallel trends. Never gate T2 estimation on these outcomes. Report the diagnosis/medication discrepancy as separate fractions, not an averaged phenotype. An event-type sensitivity treats uncertain-diabetes first events as a separate endpoint; it does not reclassify them into definite T2. 6. Record intended causal diabetes prevention target as not_identified. Even a lower cumulative recorded diabetes fraction can reflect death, emigration, ascertainment or group composition; no statement of policy prevention, postponed surgery harm or disease remission is licensed. F access from atom-000003 is contextual if available; whole-H

access is not evidence of an F surgery mechanism. CHECKS AND OUTPUTS DO241-only, DO243-only and prior metformin examples never enter F. New DO244 alone is not incident T2; DO245 cannot be backcast to 2006; same-day DE10/DE11 is uncertain. An early T2 event remains counted at later cumulative landmarks. Death before T2 prevents a T2 event. Missing drugs can block F while mortality and acute H remain active. Output components.csv includes competing-event category, counts and original denominator. Figure 4 diabetes panel uses cumulative annual t2_cumulative rows, unit events_per_1000_original_persons; all empirical cells remain unfilled.

Complete registration fields

```
id: atom-000005
topic: Recorded diabetes incidence
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: Among people without recorded baseline diabetes, how does
    ↪ cumulative
    recorded type-2 diabetes develop across baseline clinical-need groups?
  rationale: Prevention is a distinct scientific question in a disease-free
    risk set. Diabetes typing, pharmacy washout, observation-process checks,
    cumulative incidence and competing events jointly define this experiment;
    they are not separate Atoms.
  assumption: Documented outcome fields may support a restricted
    ↪ domestic-record
    description after runtime validation. Neither historical R groups nor
    outcome trends establish policy eligibility or a no-policy counterfactual.
  target_strength: associational
  target_shape: temporal
  ratings:
    importance: 5
    novelty: 2
    feasibility: 2
    data_advantage: 3
    informativeness: 0.5
  tables:
    - BEF
    - VNDS
    - DOD
    - LPR_ADM
    - LPR_DIAG
    - LPR_A_KONTAKT
    - LPR_A_DIAGNOSE
    - LPR_A_SGHOPHOLD
    - LMDB
  activation: state(atom-000002) == "historical_ready"
  verdicts:
    - key: data_gap
      region: No principal component is scientifically estimable because its
        necessary population, source, phenotype or follow-up definition is
        ↪ demonstrably
```

unavailable.

says: This endpoint question reaches an evidenced measurement boundary;
no clinical or policy null is inferred.

- key: partial
 - region: At least one principal component is scientifically estimable,
but at least one other principal component, required
 - period/group/contrast
 - or uncertainty interval is unavailable. Evaluate before sign regions.
 - says: Retain each measurable component and its direction/interval; report
every separate failure. No unavailable component erases another.
- key: higher
 - region: All principal contrasts have valid intervals/scope and every lower
limit is >0.
 - says: All principal registered descriptive contrasts are higher; this
is not a causal harm verdict.
- key: lower
 - region: All principal contrasts have valid intervals/scope and every upper
limit is <0.
 - says: All principal registered descriptive contrasts are lower; this is
not a causal benefit verdict.
- key: otherwise
 - region: otherwise
 - says: Evidence is unresolved, intervals touch/span zero, or components
combine a resolved direction with an unresolved direction. Neither
 - equivalence
 - nor uniformity is established.

protocol: |-

IMPLEMENTATION AND REPORTING CONTRACT

Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as

- incorporated definitions, not discretionary suggestions. Execute D5
- checks in their stated order. Projection is only the tables/fields
- named here and in the cited construction. No row is accessed at
- author stage. Freeze delivered field-label/code versions before
- counting. Record scope, source-date coverage, join cardinalities,
- contradictory records and duplicate counts in diagnostics.json.
- Units, inclusion, competing events and original denominators cannot
- change after viewing results.

Use exact period boundaries and domestic-record follow-up in I4/D3. Recur

- rent m values use original-group N and calendar length, not survivors
- or treated recipients. Cumulative fractions require complete interven
- ing event histories and use original N. All available outputs retain
- death/emigration counts and missing/suppressed statuses. No weighting
- , imputation, propensity matching, treatment-on-treated effect,
- hazard-ratio conversion or outcome-selected subgroup is authorized.

Use the municipality bootstrap, replicate-failure rules and pointwise des

- criptive interpretation in I5; no p-value or equivalence declaration.
- Recompute all summaries and group differences in each cluster draw. T
- here are no estimated nuisance models. Publish all component-specific
- directions with exact intervals; an aggregate local key cannot
- replace the component table. Fewer than 30 group municipalities or
- >1% undefined replicates leaves valid point descriptions but
- interval_unavailable; do not force a directional result.

Operational extraction/computation failure with no completed scientific

- output is terminal no_result, not an Atom local statistical state. If
- at least one component is scientifically complete, preserve it and
- mark each failed component no_result; apply the ordered partial-state
- rule. Evidence of a missing construct is data_gap. Unknown unresolved
- semantics without such evidence is otherwise. A timeout cannot be
- coded data_gap. No software success upgrades causal identification.

Every runtime output lives under results/atom-000005/. Write status.json,
 ↳ diagnostics.json, annual.csv (all registered years), periods.csv (all
 ↳ registered periods), contrasts.csv (all registered principal metrics)
 ↳ , causal-targets.csv (blank causal quantities, exact not_identified
 ↳ reason), and a public-safe README describing units, source/version
 ↳ and restrictions. All column contracts are D4. Persist any additional
 ↳ registered components in components.csv. No outputs exist at registra
 ↳ tion. Figure and manuscript bindings are derivative presentations.
 ↳ Synthetic boundary-date/key tests are D5 plus the unit-specific cases
 ↳ below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS

One principal contrast: t2_cumulative, 2024 R0-minus-R1 in F.
 ↳ Completeness requires the registered F cumulative history and
 ↳ principal contrast; drug-initiation and observation-process
 ↳ components remain independently reported supplements. No discordant
 ↳ Atom state is needed for this single principal endpoint.

POPULATION AND ESTIMAND

Derive F locally using D2, with the complete 1996-2006
 ↳ residence/hospital/pharmacy requirements. F is known only when all
 ↳ negative-history requirements can be checked. Do not substitute
 ↳ hospital-only absence when pharmacy history is missing. A D0241-only
 ↳ history is prevalent type-2 and cannot enter F; every D024 code
 ↳ excludes F under this deliberately strict definition. Record
 ↳ exclusions for prior A10, gestational/uncertain/type-1 diabetes and
 ↳ incomplete residence separately. F is a subset fixed before
 ↳ anticipation, never selected for later surgery, pregnancy or survival.
 The principal metric t2_cumulative is first recorded DE11*/D0241* after
 ↳ entry, before competing death/emigration and first type-1/other/uncer
 ↳ tain diabetes event. Report cumulative events per 1000 original F
 ↳ persons at ends of 2009,2010,2011,2015,2024 and annually. The
 ↳ principal descriptive contrast is R0 minus R1 cumulative fraction by
 ↳ 2024. There is no subtraction of mechanically zero baseline incidence
 ↳ and no use of late diagnosis flow as a prevention verdict.

ORDERED IMPLEMENTATION

1. Verify F and source-specific calendar coverage. For each person order
 ↳ all main/secondary diabetes records by date. Codes DE10*/D0240*
 ↳ indicate type 1; DE12*-DE14*, D0242*/D0243*/D0245*/D0249* or exact
 ↳ D024 indicate other/uncertain diabetes and compete with definite type
 ↳ 2. D0244* after entry is gestational only: flag it and continue
 ↳ observation for later definite type 2. For simultaneous non-type-2
 ↳ and type-2 records without resolvable order, assign uncertain
 ↳ competitor, not type 2. A later clarification does not retroactively
 ↳ move first-event type in the primary definition.
2. Positive A10 dispensing after baseline is recorded as new
 ↳ glucose-lowering treatment, not independently definite diabetes;
 ↳ metformin may treat PCOS. If a person's only postbaseline evidence is
 ↳ medication, they do not become a definite T2 event. Their treatment
 ↳ use is a separate cumulative drug_initiation component. This
 ↳ separates ascertainment from biological onset.
3. Build cumulative empirical subdistribution: 1000/N_Fr times number
 ↳ whose first qualifying T2 event occurs by the landmark and before the
 ↳ competing events. Death/emigration are observed competitors in this
 ↳ domestic-record target, not censoring weights. For each year report
 ↳ T2 events, competing death, emigration, other-diabetes events and
 ↳ still-no-record fraction; these sum to the appropriate original N
 ↳ except the explicitly noncompeting drug-use descriptor.

4. Compute one principal 2024 group difference with the I5 bootstrap.
 - Nonfinite/degenerate intervals are unavailable. If an earlier year is missing, all later cumulative points requiring that history are unavailable; no restart at 2019 or removal of early cases. Earlier valid points remain partial evidence.
 5. Prespecified ascertainment analyses within F: cumulative A10
 - initiation, first T2 diagnosis on inpatient versus outpatient contact, and annual all-cause hospital contact starts. They may show changes in care/recording but cannot certify biological onset or causal parallel trends. Never gate T2 estimation on these outcomes.
 - Report the diagnosis/medication discrepancy as separate fractions, not an averaged phenotype. An event-type sensitivity treats uncertain-diabetes first events as a separate endpoint; it does not reclassify them into definite T2.
 6. Record intended causal diabetes prevention target as not_identified.
 - Even a lower cumulative recorded diabetes fraction can reflect death, emigration, ascertainment or group composition; no statement of policy prevention, postponed surgery harm or disease remission is licensed. F access from atom-000003 is contextual if available; whole-H access is not evidence of an F surgery mechanism.
- CHECKS AND OUTPUTS
- D0241-only, D0243-only and prior metformin examples never enter F. New
- D0244 alone is not incident T2; D0245 cannot be backcast to 2006;
 - same-day DE10/DE11 is uncertain. An early T2 event remains counted at later cumulative landmarks. Death before T2 prevents a T2 event.
 - Missing drugs can block F while mortality and acute H remain active.
 - Output components.csv includes competing-event category, counts and original denominator. Figure 4 diabetes panel uses cumulative annual t2_cumulative rows, unit events_per_1000_original_persons; all empirical cells remain unfilled.

Registered scientific unit

Prevention is a distinct scientific question in a disease-free risk set. Diabetes typing, pharmacy washout, observation-process checks, cumulative incidence and competing events jointly define this experiment; they are not separate Atoms.

Empirical results remain unfilled. Importance is high, but novelty and feasibility are limited by the failed causal identification. No study outcome is known.

Reference implementation

Entry point and supported/unresolved components for atom-000005: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000006: Diabetes treatment burden

IMPLEMENTATION AND REPORTING CONTRACT Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as incorporated definitions, not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and duplicate counts in diagnostics.json. Units, inclusion, competing events and original

denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent m values use original-group N and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original N. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no p-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but interval_unavailable; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal no_result, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component no_result; apply the ordered partial-state rule. Evidence of a missing construct is data_gap. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded data_gap. No software success upgrades causal identification. Every runtime output lives under results/atom-000006/. Write status.json, diagnostics.json, annual.csv (all registered years), periods.csv (all registered periods), contrasts.csv (all registered principal metrics), causal-targets.csv (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS Two principal T contrasts, a10_months and t2_inpatient. Each is its long-minus-pre R0-minus-R1 change. Their partial failures and opposing directions remain expressible; no aggregate benefit index.

POPULATION AND OUTCOMES Derive hospital-defined T locally by D2, preserving uncertain diabetes separately. An unavailable pharmacy source does not prevent hospital-defined T or hospital-burden analysis. Freeze disease-history length as first recorded type-2 date and duration categories <2,2-5,>5 years before 2007; these are left-censored recorded durations, not biological disease duration. No duration-based subgroup is selected for better access or power. Principal metrics: a10_months, calendar months with at least one verified positive A10 dispensing per 1000 original-person calendar years; t2_inpatient, inpatient episodes with main DE11/DO241 diagnosis, acute or elective, per 1000 original-person calendar years. They have different units and cannot be pooled. Secondary medication components separate A10A insulin and A10B noninsulin dispensing months; a calendar month with both contributes to both separate rows but once to any-A10. No days-covered, dose, DDD or remission is inferred. **ORDERED IMPLEMENTATION 1.** Construct T with hospital fields and complete delivered baseline hospital history. Type-1 contradictions are U. Optional incomplete drug history is explicitly recorded,

without inventing absence or reclassifying T. Validate person-key equivalence PNR12 to PNR and KORR/SEKTOR definitions only for medication components. 2. For finalized positive community-pharmacy dispensings, reduce to person/local-calendar-month/ATC class indicators. Multiple purchases in a month yield one month indicator. Corrections/reversals follow the officially documented transaction logic; unresolved correction semantics makes a10_months unavailable. Do not add purchase quantities into a dose proxy. A partial terminal month counts if a dispensing occurs before D3 exit; original period calendar denominator remains fixed. 3. Assemble inpatient episodes as D3 without restricting acute status for t2_inpatient. Main diagnosis any point in the merged inpatient spell qualifies. Same-day/next-day transfers count once; all-cause acute diabetic-person admissions are a supplementary distinct metric, not relabeled diabetic complications. 4. Compute period and annual original-population rates for both components. Bootstrap the fixed long-minus-pre R0-minus-R1 contrast for each; report both even when opposing. No sign or magnitude of a10_months alone establishes benefit, adherence or remission. Lower dispensing with higher hospital burden is a discordant treatment pattern consistent with several mechanisms, including changed care; it cannot establish which mechanism. 5. Fixed supporting outputs: insulin/noninsulin splits, proportion with no dispensing recorded in each full calendar year, and duration-category group rates (only if baseline classification permits). The no-dispensing proportion is recorded use, not remission. Hospital-only burden remains interpretable if the medication arm fails; this results in partial with a scoped hospital direction. No laboratory outcome is proposed. 6. Missing official mapping or LPR3 inpatient bridge disables only that source/component/window. Pre-existing T disease does not guarantee policy eligibility or a relevant T access difference. A complete T access pattern from atom-000003 remains descriptive; no Wald ratio or mediation analysis is fitted. CHECKS AND OUTPUTS Duplicate pharmacy rows and multiple fills do not increase month counts; DO241-only enters T absent type-1 conflict; negative correction rows cannot generate medication use; missing LMDB preserves t2_inpatient; an elective diabetes admission is included; the same two directions produce discordant regardless of their scales. Figure 5 has separate a10_months and t2_inpatient panels. Table 3 reports recorded duration and drug subclasses with exact units/statuses.

Complete registration fields

```
id: atom-000006
topic: Diabetes treatment burden
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: Among people with recorded pre-existing type-2 diabetes, how do
    medication treatment and hospital burden evolve?
```

```

rationale: Medication and hospital treatment jointly address burden in
↳ prevalent
  disease. Different directions and drug-only failure have meaningful
  ↳ interpretations,
  so they remain explicit components in one experiment rather than a
  ↳ drug-remission
  claim.
assumption: Documented outcome fields may support a restricted
↳ domestic-record
  description after runtime validation. Neither historical R groups nor
  outcome trends establish policy eligibility or a no-policy counterfactual.
target_strength: associational
target_shape: temporal
ratings:
  importance: 5
  novelty: 2
  feasibility: 2
  data_advantage: 3
  informativeness: 0.5
tables:
- BEF
- VNDS
- DOD
- LPR_ADM
- LPR_DIAG
- LPR_A_KONTAKT
- LPR_A_DIAGNOSE
- LPR_A_SGHOPHOLD
- LMDB
activation: state(atom-000002) == "historical_ready"
verdicts:
- key: data_gap
  region: No principal component is scientifically estimable because its
    necessary population, source, phenotype or follow-up definition is
    ↳ demonstrably
    unavailable.
  says: This endpoint question reaches an evidenced measurement boundary;
    no clinical or policy null is inferred.
- key: partial
  region: At least one principal component is scientifically estimable,
    but at least one other principal component, required
    ↳ period/group/contrast
    or uncertainty interval is unavailable. Evaluate before sign regions.
  says: Retain each measurable component and its direction/interval; report
    every separate failure. No unavailable component erases another.
- key: discordant
  region: All principal contrasts have valid intervals and scope; at least
    one has lower>0 and at least one has upper<0.
  says: Principal components differ in descriptive direction; report them
    separately, with no average health score.
- key: higher
  region: All principal contrasts have valid intervals/scope and every lower
    limit is >0.
  says: All principal registered descriptive contrasts are higher; this
    is not a causal harm verdict.
- key: lower
  region: All principal contrasts have valid intervals/scope and every upper
    limit is <0.
  says: All principal registered descriptive contrasts are lower; this is
    not a causal benefit verdict.

```

- key: otherwise
- region: otherwise
- says: Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither
 - equivalence
 - nor uniformity is established.

protocol: |-

IMPLEMENTATION AND REPORTING CONTRACT

Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as

- incorporated definitions, not discretionary suggestions. Execute D5
- checks in their stated order. Projection is only the tables/fields
- named here and in the cited construction. No row is accessed at
- author stage. Freeze delivered field-label/code versions before
- counting. Record scope, source-date coverage, join cardinalities,
- contradictory records and duplicate counts in diagnostics.json.
- Units, inclusion, competing events and original denominators cannot
- change after viewing results.

Use exact period boundaries and domestic-record follow-up in I4/D3. Recur

- rent m values use original-group N and calendar length, not survivors
- or treated recipients. Cumulative fractions require complete interven
- ing event histories and use original N. All available outputs retain
- death/emigration counts and missing/suppressed statuses. No weighting
- , imputation, propensity matching, treatment-on-treated effect,
- hazard-ratio conversion or outcome-selected subgroup is authorized.

Use the municipality bootstrap, replicate-failure rules and pointwise des

- criptive interpretation in I5; no p-value or equivalence declaration.
- Recompute all summaries and group differences in each cluster draw. T
- here are no estimated nuisance models. Publish all component-specific
- directions with exact intervals; an aggregate local key cannot
- replace the component table. Fewer than 30 group municipalities or
- >1% undefined replicates leaves valid point descriptions but
- interval_unavailable; do not force a directional result.

Operational extraction/computation failure with no completed scientific

- output is terminal no_result, not an Atom local statistical state. If
- at least one component is scientifically complete, preserve it and
- mark each failed component no_result; apply the ordered partial-state
- rule. Evidence of a missing construct is data_gap. Unknown unresolved
- semantics without such evidence is otherwise. A timeout cannot be
- coded data_gap. No software success upgrades causal identification.

Every runtime output lives under results/atom-000006/. Write status.json,

- diagnostics.json, annual.csv (all registered years), periods.csv (all
- registered periods), contrasts.csv (all registered principal metrics)
- , causal-targets.csv (blank causal quantities, exact not_identified
- reason), and a public-safe README describing units, source/version
- and restrictions. All column contracts are D4. Persist any additional
- registered components in components.csv. No outputs exist at registra
- tion. Figure and manuscript bindings are derivative presentations.
- Synthetic boundary-date/key tests are D5 plus the unit-specific cases
- below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS

Two principal T contrasts, a10_months and t2_inpatient. Each is its

- long-minus-pre R0-minus-R1 change. Their partial failures and
- opposing directions remain expressible; no aggregate benefit index.

POPULATION AND OUTCOMES

Derive hospital-defined T locally by D2, preserving uncertain diabetes

- separately. An unavailable pharmacy source does not prevent
- hospital-defined T or hospital-burden analysis. Freeze
- disease-history length as first recorded type-2 date and duration
- categories <2,2-5,>5 years before 2007; these are left-censored
- recorded durations, not biological disease duration. No
- duration-based subgroup is selected for better access or power.

Principal metrics: a10_months, calendar months with at least one verified

- positive A10 dispensing per 1000 original-person calendar years;
- t2_inpatient, inpatient episodes with main DE11*/D0241* diagnosis,
- acute or elective, per 1000 original-person calendar years. They have
- different units and cannot be pooled. Secondary medication components
- separate A10A insulin and A10B noninsulin dispensing months; a
- calendar month with both contributes to both separate rows but once
- to any-A10. No days-covered, dose, DDD or remission is inferred.

ORDERED IMPLEMENTATION

1. Construct T with hospital fields and complete delivered baseline
 - hospital history. Type-1 contradictions are U. Optional incomplete
 - drug history is explicitly recorded, without inventing absence or
 - reclassifying T. Validate person-key equivalence PNR12 to PNR and
 - KORR/SEKTOR definitions only for medication components.
2. For finalized positive community-pharmacy dispensings, reduce to perso
 - n/local-calendar-month/ATC class indicators. Multiple purchases in a
 - month yield one month indicator. Corrections/reversals follow the off
 - icially documented transaction logic; unresolved correction semantics
 - makes a10_months unavailable. Do not add purchase quantities into a
 - dose proxy. A partial terminal month counts if a dispensing occurs
 - before D3 exit; original period calendar denominator remains fixed.
3. Assemble inpatient episodes as D3 without restricting acute status for
 - t2_inpatient. Main diagnosis any point in the merged inpatient spell
 - qualifies. Same-day/next-day transfers count once; all-cause acute
 - diabetic-person admissions are a supplementary distinct metric, not
 - relabeled diabetic complications.
4. Compute period and annual original-population rates for both
 - components. Bootstrap the fixed long-minus-pre R0-minus-R1 contrast
 - for each; report both even when opposing. No sign or magnitude of
 - a10_months alone establishes benefit, adherence or remission. Lower
 - dispensing with higher hospital burden is a discordant treatment
 - pattern consistent with several mechanisms, including changed care;
 - it cannot establish which mechanism.
5. Fixed supporting outputs: insulin/noninsulin splits, proportion with
 - no dispensing recorded in each full calendar year, and
 - duration-category group rates (only if baseline classification
 - permits). The no-dispensing proportion is recorded use, not
 - remission. Hospital-only burden remains interpretable if the
 - medication arm fails; this results in partial with a scoped hospital
 - direction. No laboratory outcome is proposed.
6. Missing official mapping or LPR3 inpatient bridge disables only that
 - source/component/window. Pre-existing T disease does not guarantee
 - policy eligibility or a relevant T access difference. A complete T
 - access pattern from atom-000003 remains descriptive; no Wald ratio or
 - mediation analysis is fitted.

CHECKS AND OUTPUTS

Duplicate pharmacy rows and multiple fills do not increase month counts;

- D0241-only enters T absent type-1 conflict; negative correction rows
- cannot generate medication use; missing LMDB preserves t2_inpatient;
- an elective diabetes admission is included; the same two directions
- produce discordant regardless of their scales. Figure 5 has separate
- a10_months and t2_inpatient panels. Table 3 reports recorded duration
- and drug subclasses with exact units/statuses.

Registered scientific unit

Medication and hospital treatment jointly address burden in prevalent disease. Different directions and drug-only failure have meaningful interpretations, so they remain explicit components in one experiment rather than a drug-remission claim.

Empirical results remain unfilled. Importance is high, but novelty and feasibility are limited by the failed causal identification. No study outcome is known.

Reference implementation

Entry point and supported/unresolved components for `atom-000006`: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000007: Psychiatric treatment

IMPLEMENTATION AND REPORTING CONTRACT Read `prereg/data-contract.md` D1-D5 and `prereg/identification.md` I4-I5 as incorporated definitions, not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and duplicate counts in `diagnostics.json`. Units, inclusion, competing events and original denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent `m` values use original-group `N` and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original `N`. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no `p`-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or $>1\%$ undefined replicates leaves valid point descriptions but `interval_unavailable`; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal `no_result`, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component `no_result`; apply the ordered partial-state rule. Evidence of a missing construct is `data_gap`. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded `data_gap`. No software success upgrades causal identification. Every runtime output lives under `results/atom-000007/`. Write `status.json`, `diagnostics.json`, `annual.csv` (all registered years), `periods.csv` (all registered periods), `contrasts.csv` (all registered principal metrics), `causal-targets.csv` (blank causal quantities, exact `not_identified` reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in

components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS `psych_starts` and `self_harm` H change contrasts. Both have independent component scope and missing statuses. A PSYK source failure may leave `self_harm`; a self-harm code gap may leave `psych_starts`. Alcohol and psychotropic classes are mandatory supplementary components but do not erase principal results.

POPULATION, METRICS AND CLINICAL SCOPE Use whole H, not a selected post-policy psychiatric-clearance cohort. Baseline psychiatric diagnoses are descriptive history, not proof of contraindication status; no claim to a clinically cleared psychiatric population is made. Primary metric `psych_starts`: new main/secondary DF* specialist psychiatric contact starts (inpatient or outpatient) per 1000 original-person calendar years. The counted unit is a contact start, not each outpatient visit or day of therapy. Self-harm admissions and alcohol-related admissions are independent supplementary outcomes, alongside psychotropic dispensing, all kept visible even if `psych_starts` is unavailable. **ORDERED IMPLEMENTATION** 1. `PSYK_ADM` person/contact/date fields join reduced `PSYK_DIAG` flags many-to-one. Deduplicate any overlap with somatic LPR by documented source lineage and natural keys. LPR3 requires verified psychiatric specialty or psychiatric-stay flag plus DF diagnosis, not assumption that any long contact is psychiatric. For multi-year outpatient pathways, count only the actual contact start; do not allocate invented visits to every year. A failure to map specialty can block `psych_starts` while somatic self-harm remains reportable. 2. `Self_harm`: acute hospital inpatient episodes carrying main or secondary external-cause ICD-10 X60-X84 (SKS DX60-DX84 and descendants), date-valid, with the D3 episode merge. Include nonfatal episodes; mortality has its separate Atom. Do not infer intent from generic poisoning without an intentional self-harm code. Missing external-cause capture prevents a complete self-harm endpoint; label a narrower coded subset explicitly. 3. `Alcohol_admissions`: inpatient episodes with main/secondary DF10*; do not call this alcohol consumption or all addiction. Psychotropic use: distinct months with verified positive dispensing in N05A, N05B, N05C, N06A; each class separately, and any-of-these once per month. Use LMDB correction/person linkage rules from D1. No specific psychiatric diagnosis is inferred from drug class. 4. Compute annual/fixed-period rates for `psych_starts`, `self_harm`, `alcohol_admissions` and psychotropic classes in H R0/R1/ALL. The principal local direction uses `psych_starts`' one I4 change contrast; additionally compare the `self_harm` change as a consequential primary safety component when fully defined. Different signs are a discordant care/harm pattern, never an average mental-health effect. Alcohol/drug rows remain supplementary, with their own directions and gaps. 5. Registered sensitivities: `psych` inpatient starts only; main DF diagnosis only; same-day-only versus next-day episode merges for self-harm and alcohol. Report component concordance with fixed principal directions using the I5 rules; missing or opposed results restrict only their supported scope. No sensitivity proves latent mental-health improvement or validates eligibility. 6. Output `annual.csv/periods.csv/contrasts.csv` and `components.csv` with `source_era`, `diagnosis_role` and specialty mapping. `Causal-targets.csv` is not identified. Complete

DOD history is needed for the domestic-record target, but missing medication or operation capture cannot erase psychiatric hospital descriptions. Suicide-specific death is omitted because DOD does not encode cause; this is a documented endpoint-scope omission, not a discovered no-suicide effect. SYNTHETIC CHECKS A five-year outpatient pathway yields one contact start, not five visits; DF10 is not all DF; drug-class use is not a diagnosis; a poisoning without DX60-DX84 is not registered intentional self-harm; a missing PSYK/LPR3 bridge leaves independently valid somatic self-harm components; negative/positive component directions stay separate. Figure 6 has psych_starts and self_harm panels; Table 3 retains alcohol/drug/sensitivity results.

Complete registration fields

```
id: atom-000007
topic: Psychiatric treatment
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: How does specialist psychiatric treatment evolve alongside
    ↪ hospital-recorded
      self-harm, alcohol treatment and psychotropic use?
  rationale: This experiment preserves an independent mental-health care
    ↪ question.
      Related service-use, alcohol, self-harm and drug outcomes are
        ↪ complementary
          evidence, not interchangeable latent wellbeing scores. Their measurement
            checks and coding sensitivities stay inside the experiment.
  assumption: Documented outcome fields may support a restricted
    ↪ domestic-record
      description after runtime validation. Neither historical R groups nor
        outcome trends establish policy eligibility or a no-policy counterfactual.
target_strength: associational
target_shape: temporal
ratings:
  importance: 5
  novelty: 2
  feasibility: 2
  data_advantage: 3
  informativeness: 0.5
tables:
- BEF
- VNDS
- DOD
- LPR_ADM
- LPR_DIAG
- LPR_A_KONTAKT
- LPR_A_DIAGNOSE
- LPR_A_SGHOPHOLD
- PSYK_ADM
- PSYK_DIAG
- LMDB
```

```

activation: state(atom-000002) == "historical_ready"
verdicts:
- key: data_gap
  region: No principal component is scientifically estimable because its
    necessary population, source, phenotype or follow-up definition is
    → demonstrably
    unavailable.
  says: This endpoint question reaches an evidenced measurement boundary;
    no clinical or policy null is inferred.
- key: partial
  region: At least one principal component is scientifically estimable,
    but at least one other principal component, required
    → period/group/contrast
    or uncertainty interval is unavailable. Evaluate before sign regions.
  says: Retain each measurable component and its direction/interval; report
    every separate failure. No unavailable component erases another.
- key: discordant
  region: All principal contrasts have valid intervals and scope; at least
    one has lower>0 and at least one has upper<0.
  says: Principal components differ in descriptive direction; report them
    separately, with no average health score.
- key: higher
  region: All principal contrasts have valid intervals/scope and every lower
    limit is >0.
  says: All principal registered descriptive contrasts are higher; this
    is not a causal harm verdict.
- key: lower
  region: All principal contrasts have valid intervals/scope and every upper
    limit is <0.
  says: All principal registered descriptive contrasts are lower; this is
    not a causal benefit verdict.
- key: otherwise
  region: otherwise
  says: Evidence is unresolved, intervals touch/span zero, or components
    combine a resolved direction with an unresolved direction. Neither
    → equivalence
    nor uniformity is established.
protocol: |-
  IMPLEMENTATION AND REPORTING CONTRACT
  Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as
  → incorporated definitions, not discretionary suggestions. Execute D5
  → checks in their stated order. Projection is only the tables/fields
  → named here and in the cited construction. No row is accessed at
  → author stage. Freeze delivered field-label/code versions before
  → counting. Record scope, source-date coverage, join cardinalities,
  → contradictory records and duplicate counts in diagnostics.json.
  → Units, inclusion, competing events and original denominators cannot
  → change after viewing results.
  Use exact period boundaries and domestic-record follow-up in I4/D3. Recur
  → rent m values use original-group N and calendar length, not survivors
  → or treated recipients. Cumulative fractions require complete interven
  → ing event histories and use original N. All available outputs retain
  → death/emigration counts and missing/suppressed statuses. No weighting
  → , imputation, propensity matching, treatment-on-treated effect,
  → hazard-ratio conversion or outcome-selected subgroup is authorized.

```

Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no p-value or equivalence declaration.

- Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but interval_unavailable; do not force a directional result.

Operational extraction/computation failure with no completed scientific output is terminal no_result, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component no_result; apply the ordered partial-state rule. Evidence of a missing construct is data_gap. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded data_gap. No software success upgrades causal identification.

Every runtime output lives under results/atom-000007/. Write status.json, diagnostics.json, annual.csv (all registered years), periods.csv (all registered periods), contrasts.csv (all registered principal metrics), causal-targets.csv (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS

psych_starts and self_harm H change contrasts. Both have independent component scope and missing statuses. A PSYK source failure may leave self_harm; a self-harm code gap may leave psych_starts. Alcohol and psychotropic classes are mandatory supplementary components but do not erase principal results.

POPULATION, METRICS AND CLINICAL SCOPE

Use whole H, not a selected post-policy psychiatric-clearance cohort.

- Baseline psychiatric diagnoses are descriptive history, not proof of contraindication status; no claim to a clinically cleared psychiatric population is made. Primary metric psych_starts: new main/secondary DF* specialist psychiatric contact starts (inpatient or outpatient) per 1000 original-person calendar years. The counted unit is a contact start, not each outpatient visit or day of therapy. Self-harm admissions and alcohol-related admissions are independent supplementary outcomes, alongside psychotropic dispensing, all kept visible even if psych_starts is unavailable.

ORDERED IMPLEMENTATION

1. PSYK_ADM person/contact/date fields join reduced PSYK_DIAG flags
 - many-to-one. Deduplicate any overlap with somatic LPR by documented source lineage and natural keys. LPR3 requires verified psychiatric specialty or psychiatric-stay flag plus DF diagnosis, not assumption that any long contact is psychiatric. For multi-year outpatient pathways, count only the actual contact start; do not allocate invented visits to every year. A failure to map specialty can block psych_starts while somatic self-harm remains reportable.
2. Self_harm: acute hospital inpatient episodes carrying main or secondary external-cause ICD-10 X60-X84 (SKS DX60-DX84 and descendants), date-valid, with the D3 episode merge. Include nonfatal episodes; mortality has its separate Atom. Do not infer intent from generic poisoning without an intentional self-harm code. Missing external-cause capture prevents a complete self-harm endpoint; label a narrower coded subset explicitly.

3. Alcohol_admissions: inpatient episodes with main/secondary DF10*; do
 - not call this alcohol consumption or all addiction. Psychotropic use:
 - distinct months with verified positive dispensing in N05A, N05B, N05C, N06A; each class separately, and any-of-these once per month.
 - Use LMDB correction/person linkage rules from D1. No specific psychiatric diagnosis is inferred from drug class.
 4. Compute annual/fixed-period rates for psych_starts, self_harm, alcohol_admissions and psychotropic classes in H R0/R1/ALL. The principal local direction uses psych_starts' one I4 change contrast; additionally compare the self_harm change as a consequential primary safety component when fully defined. Different signs are a discordant care/harm pattern, never an average mental-health effect. Alcohol/drug rows remain supplementary, with their own directions and gaps.
 5. Registered sensitivities: psych inpatient starts only; main DF diagnosis only; same-day-only versus next-day episode merges for self-harm and alcohol. Report component concordance with fixed principal directions using the I5 rules; missing or opposed results restrict only their supported scope. No sensitivity proves latent mental-health improvement or validates eligibility.
 6. Output annual.csv/periods.csv/contrasts.csv and components.csv with source_era, diagnosis_role and specialty mapping. Causal-targets.csv is not_identified. Complete DOD history is needed for the domestic-record target, but missing medication or operation capture cannot erase psychiatric hospital descriptions. Suicide-specific death is omitted because DOD does not encode cause; this is a documented endpoint-scope omission, not a discovered no-suicide effect.
- SYNTHETIC CHECKS
- A five-year outpatient pathway yields one contact start, not five visits;
 - DF10 is not all DF; drug-class use is not a diagnosis; a poisoning without DX60-DX84 is not registered intentional self-harm; a missing PSYK/LPR3 bridge leaves independently valid somatic self-harm components; negative/positive component directions stay separate.
 - Figure 6 has psych_starts and self_harm panels; Table 3 retains alcohol/drug/sensitivity results.

Registered scientific unit

This experiment preserves an independent mental-health care question. Related service-use, alcohol, self-harm and drug outcomes are complementary evidence, not interchangeable latent wellbeing scores. Their measurement checks and coding sensitivities stay inside the experiment.

Empirical results remain unfilled. Importance is high, but novelty and feasibility are limited by the failed causal identification. No study outcome is known.

Reference implementation

Entry point and supported/unresolved components for atom-000007: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000008: All-cause mortality

IMPLEMENTATION AND REPORTING CONTRACT Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as incorporated definitions,

not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and duplicate counts in diagnostics.json. Units, inclusion, competing events and original denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent m values use original-group N and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original N. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no p-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but interval_unavailable; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal no_result, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component no_result; apply the ordered partial-state rule. Evidence of a missing construct is data_gap. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded data_gap. No software success upgrades causal identification. Every runtime output lives under results/atom-000008/. Write status.json, diagnostics.json, annual.csv (all registered years), periods.csv (all registered periods), contrasts.csv (all registered principal metrics), causal-targets.csv (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS One principal death_cumulative 2024 R0-minus-R1 contrast in H; principal completeness requires the registered cumulative vital-event history. Emigration is a competing category and an interpretation requirement, not a selected censoring sensitivity.

POPULATION AND ESTIMAND Use whole H, with R frozen by atom-000002. No pharmacy, operation or hospital-outcome field is required after baseline. Primary metric death_cumulative is the fraction of original H with a recorded death from entry through 31 December 2024 before first emigration, times 1000. This is domestic recorded all-cause death under the actual migration/policy path, not mortality under hypothetical nonemigration or an unconditional global death registry. Unit deaths_per_1000_original_persons. The primary descriptive contrast is R0 minus R1 at 2024; baseline disease differences are not adjusted into causality. **ORDERED IMPLEMENTATION** 1. Validate complete historical DOD and VNDS delivery and

label meanings independently of other modules. Require one compatible death date per person. Same-day death/emigration uses D3's death-first rule. BEF conflicts discovered after H creation invalidate the affected mortality component and are logged; do not mutate H retrospectively or replace a death date with a hospital surrogate. 2. For every H person define mutually exclusive first exit: death, emigration or event-free at each landmark. Admin end is a fixed common date; a missing delivered end-year blocks that landmark. No conditioning on being alive in January 2011 or 2016. People who died before reform remain in original H and have no later event opportunities. 3. Compute cumulative death and emigration fractions and annual first-death increments at all registered landmarks. Explicitly reconcile increments to cumulative fractions. No late death increment is called a survival effect or substituted for cumulative death. Estimate the 2024 R0-R1 fraction difference using the I5 bootstrap; no survival hazard model, proportional-hazards assumption or informative-censoring extrapolation is introduced. 4. Report the ALL cumulative series and group series, with N, contributing municipalities and emigration fractions. If a group is empty, its difference is data_gap and ALL remains valid. With zero deaths and degenerate intervals, retain observed fraction and interval_unavailable; do not report equivalence or low policy harm. 5. All-cause death remains mandatory even if psychiatric or cardiovascular events are sparse. No event-frequency claim or near-age-threshold power advantage is inferred from metadata. Causes of death would require a separate frozen allowed-field mapping; this protocol does not infer suicide or cardiovascular death from admissions or from DOD. CHECKS AND OUTPUTS An emigrant who later dies is not counted as a domestic death; same-day death/emigration counts death once; repeated identical DOD rows yield one death; a person dying in 2008 remains in the original 2024 denominator and cumulative numerator; failed LMDB, PSYK or surgery extraction cannot prevent this Atom from activating. components.csv preserves annual increments and competing emigration. Figure 4 mortality panel consumes annual.csv cumulative rows and does not share an axis with diabetes. Causal mortality quantities remain unidentified under every possible descriptive direction.

Complete registration fields

```
id: atom-000008
topic: All-cause mortality
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: What is cumulative recorded all-cause mortality in the historical
    clinical groups over long follow-up?
  rationale: Mortality is independently consequential and must not disappear
    inside a hospital-burden index or because diabetes, psychiatry or surgery
    capture fails. Its cumulative estimand and vital-data checks form one
    coherent scientific unit.
```

```

assumption: Documented outcome fields may support a restricted
↳ domestic-record
  description after runtime validation. Neither historical R groups nor
  outcome trends establish policy eligibility or a no-policy counterfactual.
target_strength: associational
target_shape: temporal
ratings:
  importance: 5
  novelty: 2
  feasibility: 2
  data_advantage: 3
  informativeness: 0.5
tables:
- BEF
- VNDS
- DOD
activation: state(atom-000002) == "historical_ready"
verdicts:
- key: data_gap
  region: No principal component is scientifically estimable because its
  necessary population, source, phenotype or follow-up definition is
  ↳ demonstrably
  unavailable.
  says: This endpoint question reaches an evidenced measurement boundary;
  no clinical or policy null is inferred.
- key: partial
  region: At least one principal component is scientifically estimable,
  but at least one other principal component, required
  ↳ period/group/contrast
  or uncertainty interval is unavailable. Evaluate before sign regions.
  says: Retain each measurable component and its direction/interval; report
  every separate failure. No unavailable component erases another.
- key: higher
  region: All principal contrasts have valid intervals/scope and every lower
  limit is >0.
  says: All principal registered descriptive contrasts are higher; this
  is not a causal harm verdict.
- key: lower
  region: All principal contrasts have valid intervals/scope and every upper
  limit is <0.
  says: All principal registered descriptive contrasts are lower; this is
  not a causal benefit verdict.
- key: otherwise
  region: otherwise
  says: Evidence is unresolved, intervals touch/span zero, or components
  combine a resolved direction with an unresolved direction. Neither
  ↳ equivalence
  nor uniformity is established.
protocol: |-
IMPLEMENTATION AND REPORTING CONTRACT
Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as
↳ incorporated definitions, not discretionary suggestions. Execute D5
↳ checks in their stated order. Projection is only the tables/fields
↳ named here and in the cited construction. No row is accessed at
↳ author stage. Freeze delivered field-label/code versions before
↳ counting. Record scope, source-date coverage, join cardinalities,
↳ contradictory records and duplicate counts in diagnostics.json.
↳ Units, inclusion, competing events and original denominators cannot
↳ change after viewing results.

```

Use exact period boundaries and domestic-record follow-up in I4/D3. Recur
 ↪ rent m values use original-group N and calendar length, not survivors
 ↪ or treated recipients. Cumulative fractions require complete interven
 ↪ ing event histories and use original N. All available outputs retain
 ↪ death/emigration counts and missing/suppressed statuses. No weighting
 ↪ , imputation, propensity matching, treatment-on-treated effect,
 ↪ hazard-ratio conversion or outcome-selected subgroup is authorized.
 Use the municipality bootstrap, replicate-failure rules and pointwise des
 ↪ criptive interpretation in I5; no p-value or equivalence declaration.
 ↪ Recompute all summaries and group differences in each cluster draw. T
 ↪ here are no estimated nuisance models. Publish all component-specific
 ↪ directions with exact intervals; an aggregate local key cannot
 ↪ replace the component table. Fewer than 30 group municipalities or
 ↪ >1% undefined replicates leaves valid point descriptions but
 ↪ interval_unavailable; do not force a directional result.
 Operational extraction/computation failure with no completed scientific
 ↪ output is terminal no_result, not an Atom local statistical state. If
 ↪ at least one component is scientifically complete, preserve it and
 ↪ mark each failed component no_result; apply the ordered partial-state
 ↪ rule. Evidence of a missing construct is data_gap. Unknown unresolved
 ↪ semantics without such evidence is otherwise. A timeout cannot be
 ↪ coded data_gap. No software success upgrades causal identification.
 Every runtime output lives under results/atom-000008/. Write status.json,
 ↪ diagnostics.json, annual.csv (all registered years), periods.csv (all
 ↪ registered periods), contrasts.csv (all registered principal metrics)
 ↪ , causal-targets.csv (blank causal quantities, exact not_identified
 ↪ reason), and a public-safe README describing units, source/version
 ↪ and restrictions. All column contracts are D4. Persist any additional
 ↪ registered components in components.csv. No outputs exist at registra
 ↪ tion. Figure and manuscript bindings are derivative presentations.
 ↪ Synthetic boundary-date/key tests are D5 plus the unit-specific cases
 ↪ below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS

One principal death_cumulative 2024 R0-minus-R1 contrast in H; principal
 ↪ completeness requires the registered cumulative vital-event history.
 ↪ Emigration is a competing category and an interpretation requirement,
 ↪ not a selected censoring sensitivity.

POPULATION AND ESTIMAND

Use whole H, with R frozen by atom-000002. No pharmacy, operation or
 ↪ hospital-outcome field is required after baseline. Primary metric
 ↪ death_cumulative is the fraction of original H with a recorded death
 ↪ from entry through 31 December 2024 before first emigration, times
 ↪ 1000. This is domestic recorded all-cause death under the actual
 ↪ migration/policy path, not mortality under hypothetical nonemigration
 ↪ or an unconditional global death registry. Unit deaths_per_1000_origi
 ↪ nal_persons. The primary descriptive contrast is R0 minus R1 at 2024;
 ↪ baseline disease differences are not adjusted into causality.

ORDERED IMPLEMENTATION

1. Validate complete historical DOD and VNDS delivery and label meanings
 ↪ independently of other modules. Require one compatible death date per
 ↪ person. Same-day death/emigration uses D3's death-first rule. BEF
 ↪ conflicts discovered after H creation invalidate the affected
 ↪ mortality component and are logged; do not mutate H retrospectively
 ↪ or replace a death date with a hospital surrogate.

2. For every H person define mutually exclusive first exit: death, emigration or event-free at each landmark. Admin end is a fixed common date; a missing delivered end-year blocks that landmark. No conditioning on being alive in January 2011 or 2016. People who died before reform remain in original H and have no later event opportunities.
 3. Compute cumulative death and emigration fractions and annual first-death increments at all registered landmarks. Explicitly reconcile increments to cumulative fractions. No late death increment is called a survival effect or substituted for cumulative death. Estimate the 2024 R0-R1 fraction difference using the I5 bootstrap; no survival hazard model, proportional-hazards assumption or informative-censoring extrapolation is introduced.
 4. Report the ALL cumulative series and group series, with N, contributing municipalities and emigration fractions. If a group is empty, its difference is data_gap and ALL remains valid. With zero deaths and degenerate intervals, retain observed fraction and interval_unavailable; do not report equivalence or low policy harm.
 5. All-cause death remains mandatory even if psychiatric or cardiovascular events are sparse. No event-frequency claim or near-age-threshold power advantage is inferred from metadata. Causes of death would require a separate frozen allowed-field mapping; this protocol does not infer suicide or cardiovascular death from admissions or from DOD.
- CHECKS AND OUTPUTS
- An emigrant who later dies is not counted as a domestic death; same-day death/emigration counts death once; repeated identical DOD rows yield one death; a person dying in 2008 remains in the original 2024 denominator and cumulative numerator; failed LMDB, PSYK or surgery extraction cannot prevent this Atom from activating. components.csv preserves annual increments and competing emigration. Figure 4 mortality panel consumes annual.csv cumulative rows and does not share an axis with diabetes. Causal mortality quantities remain unidentified under every possible descriptive direction.

Registered scientific unit

Mortality is independently consequential and must not disappear inside a hospital-burden index or because diabetes, psychiatry or surgery capture fails. Its cumulative estimand and vital-data checks form one coherent scientific unit.

Empirical results remain unfilled. Importance is high, but novelty and feasibility are limited by the failed causal identification. No study outcome is known.

Reference implementation

Entry point and supported/unresolved components for atom-000008: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.

atom-000009: Surgical safety

IMPLEMENTATION AND REPORTING CONTRACT Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as incorporated definitions, not discretionary suggestions. Execute D5 checks in their stated order. Projection is only the tables/fields named here and in the cited construction. No row is accessed at author stage. Freeze delivered field-label/code versions before counting. Record scope, source-date coverage, join cardinalities, contradictory records and

duplicate counts in diagnostics.json. Units, inclusion, competing events and original denominators cannot change after viewing results. Use exact period boundaries and domestic-record follow-up in I4/D3. Recurrent m values use original-group N and calendar length, not survivors or treated recipients. Cumulative fractions require complete intervening event histories and use original N. All available outputs retain death/emigration counts and missing/suppressed statuses. No weighting, imputation, propensity matching, treatment-on-treated effect, hazard-ratio conversion or outcome-selected subgroup is authorized. Use the municipality bootstrap, replicate-failure rules and pointwise descriptive interpretation in I5; no p-value or equivalence declaration. Recompute all summaries and group differences in each cluster draw. There are no estimated nuisance models. Publish all component-specific directions with exact intervals; an aggregate local key cannot replace the component table. Fewer than 30 group municipalities or >1% undefined replicates leaves valid point descriptions but interval_unavailable; do not force a directional result. Operational extraction/computation failure with no completed scientific output is terminal no_result, not an Atom local statistical state. If at least one component is scientifically complete, preserve it and mark each failed component no_result; apply the ordered partial-state rule. Evidence of a missing construct is data_gap. Unknown unresolved semantics without such evidence is otherwise. A timeout cannot be coded data_gap. No software success upgrades causal identification. Every runtime output lives under results/atom-000009/. Write status.json, diagnostics.json, annual.csv (all registered years), periods.csv (all registered periods), contrasts.csv (all registered principal metrics), causal-targets.csv (blank causal quantities, exact not_identified reason), and a public-safe README describing units, source/version and restrictions. All column contracts are D4. Persist any additional registered components in components.csv. No outputs exist at registration. Figure and manuscript bindings are derivative presentations. Synthetic boundary-date/key tests are D5 plus the unit-specific cases below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS Two principal population change contrasts, comp_hospital and repeat_procedure, with distinct component tables. Principal completeness includes their required calendar windows and intervals only; conditional surgery-clock risks, nutrition, hypoglycemia and introduced-code components remain mandatory supplements with independent statuses. Lower complication burden and higher reintervention burden is discordant; missing either is partial, never a common all-or-nothing safety failure.

POPULATION, CLOCKS AND DENOMINATORS Population-scale safety uses original H denominators, including never-operated people. It is not a policy ITT because eligibility/counterfactual identification fails. Operation-conditional descriptions use each person's first qualifying post-entry operation, among operations between 2007-01-01 and 2019-12-31 so a fixed 1825-day horizon fits through 2024. Entry to that conditional cohort is treatment selection and therefore cannot support a causal recipient/nonrecipient or pre/post-policy surgery comparison. Death and first emigration after the operation are competitors; never require survival or future residence to enter. Administrative/source coverage of the entire fixed window, not individual event-free survival, is required. No conditional age/group surgery-effect

claim. Named index operations use D3's stable codes plus separately identified sleeve codes only in their valid periods. Primary population metrics `comp_hospital` and `repeat_procedure` count (a) inpatient diagnosis-coded potential surgical complications DT81/DK91 on an index stay or within 90 days, and (b) later-date repeat named restrictive/bypass/banding surgery or explicit gastrointestinal reoperation KJW* within 1825 days of a qualifying operation. The two main descriptive long-minus-pre R0-minus-R1 contrasts keep units `events_per_1000_original_person_years` separate by metric. KJW is general gastrointestinal reoperation, not bariatric-specific revision. Reversals and other code-introduction components are kept separate, not retrospectively added to a stable contrast.

ORDERED SAFETY CONSTRUCTION

1. Build valid surgery dates with D1/D3 contact/pathway/private deduplication inside this safety unit, or consume an already validated surgery ledger from atom-000003 with identical hash/definition. Do not depend on its sign or payer result. This is outcome anchoring, not re-estimating a failed access question. If surgery anchoring fails, no procedure-linked safety component is available; other health Atoms remain active. Validate each safety outcome source separately.
2. Construct all inpatient spells, including elective index admissions. `comp_hospital` has two mandatory separate sub-components: `index_stay_flag` (any main/secondary DT81/DK91 on the inpatient spell containing the index operation) and `postdischarge_comp` (new inpatient episode with DT81/DK91 beginning after index discharge and within the assigned operation window). An index flag has uncertain onset and may predate surgery; label it a potential complication recorded on the index stay, not postoperative incidence. Do not exclude it merely because the index admission was elective. Index and readmission components are never presented as validated attributable complication probability.
3. For population counts each qualifying non-index safety episode is assigned to the most recent qualifying operation on or before its start. Count the episode once per metric regardless of codes and overlapping operation windows. Retain days-since-anchor. An index episode carrying the operation itself is flagged once, not once per transfer. For repeat surgery, compare with the most recent strictly earlier qualifying surgery day. Same-day multiple primary operations cannot be distinguished by the surgery-day definition: report `same_day_repeat` as unavailable, never zero. Explicit time-valid KJW codes on operation day can still be counted as general GI reoperation. Reversal KJDF50/51 from 2020, band removal and mesenteric-defect repair are separate code-introduction descriptions only when specifically verified; no inferred historical crosswalk is applied.
4. Operation-clock windows are 0-30,31-90,91-365,366-1825 inclusive days. For each first post-entry operation in the fixed entry range, report first-event fraction within each window among the original operation cohort, before death/emigration; prior nonfatal events do not remove people from later-window denominators. Report recurrent counts separately. For repeat-primary procedures 0-30 has a day-zero limitation: preserve a status-only 0-30 full-repeat target and a measurable 1-30 later-date-repeat component. KJW early reoperations retain 0-30. A missing reversal definition cannot suppress complication or stable-repeat windows. Death/emigration fractions for each window are separate, with equal-day ordering D3.
5. Complication-coded hospital episodes are also described for 91-365 and 366-1825; attribution weakens with elapsed time and no causal label is permitted.

Register hospital-treated hypoglycemia DE160/DE161/DE162, *malabsorption* DK90, and deficiency/malnutrition DE43/DE44/DE46/DE50-DE56/DE58-DE61/DE63 as separate late-safety components, any diagnosis position in inpatient episodes after a qualifying operation. These are recorded conditions, not proven surgical sequelae, biochemical measurements or comprehensive nutrition assessment. No single composite score is formed. Their baseline histories are reported, not used as post-treatment exclusions. 6. Population counts include operations through the end of each calendar window but events only through that end. They describe realized recorded burden during that window, not a standardized post-operation risk. Conditional 1825-day risk uses only the prespecified earlier operation-entry dates; newer operations are listed as administratively ineligible for that fixed-clock analysis, not removed from population counts. If a source code is introduced after entry, the entire relevant historical conditional component is unavailable; do not use a changing capture definition to compare surgery cohorts. 7. Principal stable population contrasts use `index_stay_flag` plus `postdischarge_comp` within 90 days as `comp_hospital`, with overlapping same episode counted once, and `repeat_procedure` split visibly into later-date repeat named surgery and general KJW. If the full repeat union cannot be defined comparably, mark that contrast unavailable and retain each measurable component. Missing the repeat target yields partial, not a complication failure. Code-introduction expansions, strict index-date-excluded complication sensitivity, and overlap/same-day merging are mandatory supplementary outputs; no direction selects one. 8. Apply the I5 bootstrap at baseline municipality, retaining each person's complete operation/event history. For conditional risks resample H clusters then reconstruct the original first-operation subset each draw; no nuisance fits. Report denominators as `original_H` or `first_postentry_operation_cohort` and clocks `calendar/operation` explicitly. One recipient with repeated events contributes once to a first-event window fraction and all distinct episodes to the recurrent count. No conditional estimates are interpreted as policy effects or treated-versus-untreated comparisons. OUTPUTS, STATES AND CHECKS components.csv is mandatory and uses every D4 safety field: component, clock, window_start, window_end, anchor, calendar_period, group, stratum, denominator_type, numerator, denominator_n, person_years, estimate, lower, upper, unit, mode, status, reason. Primary contrasts stay in contrasts.csv. Figure 7 consumes conditional 0-30/31-90/91-365/366-1825 potential-complication and general-GI-reoperation rows for ALL, original operation-cohort denominator; extra same-day limitations and exact missing reasons are visible. Table 4 contains population burdens, later-date repeat procedures, attribution-limited nutrition/hypoglycemia and code-introduction rows. Synthetic: elective index-stay DT81 is retained; duplicate transfer diagnoses count once; two operations with overlapping windows assign an event once to the most recent prior operation; KJW after unrelated GI treatment is not called bariatric revision; operation in 2019 has 1825-day administrative coverage but one in 2022 does not enter the fixed conditional cohort; death day 10 remains in the original denominator; absent reversal codes do not block complications; absent day-zero repeat information does not become no early reintervention. No operation-clock point is fabricated when no operation cohort exists. EXACT FIGURE INTERFACE The operation-clock display rows in components.csv have `metric=window_first_event`;

component=potential_complication or gi_reoperation; clock=operation; group=ALL; stratum=H; anchor=first_postentry_operation; denominator_type=first_postentry_operation_cohort; calendar_period=entry_2007_2019; period is the string 0-30,31-90,91-365,366-1825 matching integer window_start/window_end. potential_complication counts first qualifying DT81/DK91 inpatient episode in the window, including the index-stay flag in 0-30 with onset uncertainty; gi_reoperation counts first explicit KJW episode in the window. Index-stay flags contribute only to the first window. Each estimate is 1000 times the number of operation-cohort persons with at least one such window event before death/emigration divided by the original operation-cohort N, unit=events_per_1000_operations, mode=descriptive. Recurrent counts and later-date repeated primary surgery are separate table components and never silently added to the plotted first-event fraction. All eight expected rows exist even when unavailable. Figure 7 does not show an unregistered combined total.

Complete registration fields

```
id: atom-000009
topic: Surgical safety
atom_result: prereg
atom_strength: null
atom_shape: null
evidence_paths: []
concepts: []
literature: []
bonds: []
preregistration:
  version: 1
  mode: adaptive
  question: What recorded hospital complications and reinterventions accompany
    subsequent bariatric procedures, on both population and operation clocks?
  rationale: Complications and reinterventions jointly characterize the safety
    cost accompanying recorded operations. They belong in one safety
    ↪ experiment
    with distinct components, clocks and attribution limits. Independent
    ↪ component
    failures and early/late windows remain visible; related code lookups or
    models do not become separate Atoms.
  assumption: Documented outcome fields may support a restricted
    ↪ domestic-record
    description after runtime validation. Neither historical R groups nor
    outcome trends establish policy eligibility or a no-policy counterfactual.
  target_strength: associational
  target_shape: temporal
  ratings:
    importance: 5
    novelty: 2
    feasibility: 2
    data_advantage: 3
    informativeness: 0.5
  tables:
    - BEF
    - VNDS
    - DOD
    - LPR_ADM
    - LPR_DIAG
```

- LPR_A_KONTAKT
- LPR_A_DIAGNOSE
- LPR_A_SGHOPHOLD
- LPR_SKSOPR
- PRIV_ADM
- PRIV_SKSOPR
- LPR_A_FORLOEB
- LPR_A_PROCREGISTRERING

activation: state(atom-000002) == "historical_ready"

verdicts:

- key: data_gap
 - region: No principal component is scientifically estimable because its necessary population, source, phenotype or follow-up definition is
 - demonstrably unavailable.
 - says: This endpoint question reaches an evidenced measurement boundary; no clinical or policy null is inferred.
- key: partial
 - region: At least one principal component is scientifically estimable, but at least one other principal component, required
 - period/group/contrast
 - or uncertainty interval is unavailable. Evaluate before sign regions.
 - says: Retain each measurable component and its direction/interval; report every separate failure. No unavailable component erases another.
- key: discordant
 - region: All principal contrasts have valid intervals and scope; at least one has lower>0 and at least one has upper<0.
 - says: Principal components differ in descriptive direction; report them separately, with no average health score.
- key: higher
 - region: All principal contrasts have valid intervals/scope and every lower limit is >0.
 - says: All principal registered descriptive contrasts are higher; this is not a causal harm verdict.
- key: lower
 - region: All principal contrasts have valid intervals/scope and every upper limit is <0.
 - says: All principal registered descriptive contrasts are lower; this is not a causal benefit verdict.
- key: otherwise
 - region: otherwise
 - says: Evidence is unresolved, intervals touch/span zero, or components combine a resolved direction with an unresolved direction. Neither
 - equivalence
 - nor uniformity is established.

protocol: |-

IMPLEMENTATION AND REPORTING CONTRACT

Read prereg/data-contract.md D1-D5 and prereg/identification.md I4-I5 as

- incorporated definitions, not discretionary suggestions. Execute D5
- checks in their stated order. Projection is only the tables/fields
- named here and in the cited construction. No row is accessed at
- author stage. Freeze delivered field-label/code versions before
- counting. Record scope, source-date coverage, join cardinalities,
- contradictory records and duplicate counts in diagnostics.json.
- Units, inclusion, competing events and original denominators cannot
- change after viewing results.

Use exact period boundaries and domestic-record follow-up in I4/D3. Recur
 → rent m values use original-group N and calendar length, not survivors
 → or treated recipients. Cumulative fractions require complete interven
 → ing event histories and use original N. All available outputs retain
 → death/emigration counts and missing/suppressed statuses. No weighting
 → , imputation, propensity matching, treatment-on-treated effect,
 → hazard-ratio conversion or outcome-selected subgroup is authorized.
 Use the municipality bootstrap, replicate-failure rules and pointwise des
 → criptive interpretation in I5; no p-value or equivalence declaration.
 → Recompute all summaries and group differences in each cluster draw. T
 → here are no estimated nuisance models. Publish all component-specific
 → directions with exact intervals; an aggregate local key cannot
 → replace the component table. Fewer than 30 group municipalities or
 → >1% undefined replicates leaves valid point descriptions but
 → interval_unavailable; do not force a directional result.
 Operational extraction/computation failure with no completed scientific
 → output is terminal no_result, not an Atom local statistical state. If
 → at least one component is scientifically complete, preserve it and
 → mark each failed component no_result; apply the ordered partial-state
 → rule. Evidence of a missing construct is data_gap. Unknown unresolved
 → semantics without such evidence is otherwise. A timeout cannot be
 → coded data_gap. No software success upgrades causal identification.
 Every runtime output lives under results/atom-000009/. Write status.json,
 → diagnostics.json, annual.csv (all registered years), periods.csv (all
 → registered periods), contrasts.csv (all registered principal metrics)
 → , causal-targets.csv (blank causal quantities, exact not_identified
 → reason), and a public-safe README describing units, source/version
 → and restrictions. All column contracts are D4. Persist any additional
 → registered components in components.csv. No outputs exist at registra
 → tion. Figure and manuscript bindings are derivative presentations.
 → Synthetic boundary-date/key tests are D5 plus the unit-specific cases
 → below; numerical fixtures must never become paper estimates.

PRINCIPAL LOCAL-STATE COMPONENTS

Two principal population change contrasts, comp_hospital and
 → repeat_procedure, with distinct component tables. Principal
 → completeness includes their required calendar windows and intervals
 → only; conditional surgery-clock risks, nutrition, hypoglycemia and
 → introduced-code components remain mandatory supplements with
 → independent statuses. Lower complication burden and higher
 → reintervention burden is discordant; missing either is partial, never
 → a common all-or-nothing safety failure.

POPULATION, CLOCKS AND DENOMINATORS

Population-scale safety uses original H denominators, including
 → never-operated people. It is not a policy ITT because eligibility/cou
 → nterfactual identification fails. Operation-conditional descriptions
 → use each person's first qualifying post-entry operation, among
 → operations between 2007-01-01 and 2019-12-31 so a fixed 1825-day
 → horizon fits through 2024. Entry to that conditional cohort is
 → treatment selection and therefore cannot support a causal
 → recipient/nonrecipient or pre/post-policy surgery comparison. Death
 → and first emigration after the operation are competitors; never
 → require survival or future residence to enter. Administrative/source
 → coverage of the entire fixed window, not individual event-free
 → survival, is required. No conditional age/group surgery-effect claim.

Named index operations use D3's stable codes plus separately identified
 ↳ sleeve codes only in their valid periods. Primary population metrics
 ↳ comp_hospital and repeat_procedure count (a) inpatient
 ↳ diagnosis-coded potential surgical complications DT81*/DK91* on an
 ↳ index stay or within 90 days, and (b) later-date repeat named
 ↳ restrictive/bypass/banding surgery or explicit gastrointestinal
 ↳ reoperation KJW* within 1825 days of a qualifying operation. The two
 ↳ main descriptive long-minus-pre R0-minus-R1 contrasts keep units
 ↳ events_per_1000_original_person_years separate by metric. KJW is
 ↳ general gastrointestinal reoperation, not bariatric-specific
 ↳ revision. Reversals and other code-introduction components are kept
 ↳ separate, not retrospectively added to a stable contrast.

ORDERED SAFETY CONSTRUCTION

1. Build valid surgery dates with D1/D3 contact/pathway/private deduplica-
 ↳ tion inside this safety unit, or consume an already validated surgery
 ↳ ledger from atom-000003 with identical hash/definition. Do not depend
 ↳ on its sign or payer result. This is outcome anchoring, not
 ↳ re-estimating a failed access question. If surgery anchoring fails,
 ↳ no procedure-linked safety component is available; other health Atoms
 ↳ remain active. Validate each safety outcome source separately.
2. Construct all inpatient spells, including elective index admissions.
 ↳ comp_hospital has two mandatory separate subcomponents:
 ↳ index_stay_flag (any main/secondary DT81*/DK91* on the inpatient
 ↳ spell containing the index operation) and postdischarge_comp (new
 ↳ inpatient episode with DT81*/DK91* beginning after index discharge
 ↳ and within the assigned operation window). An index flag has
 ↳ uncertain onset and may predate surgery; label it a potential
 ↳ complication recorded on the index stay, not postoperative incidence.
 ↳ Do not exclude it merely because the index admission was elective.
 ↳ Index and readmission components are never presented as validated
 ↳ attributable complication probability.
3. For population counts each qualifying non-index safety episode is
 ↳ assigned to the most recent qualifying operation on or before its
 ↳ start. Count the episode once per metric regardless of codes and
 ↳ overlapping operation windows. Retain days-since-anchor. An index
 ↳ episode carrying the operation itself is flagged once, not once per
 ↳ transfer. For repeat surgery, compare with the most recent strictly
 ↳ earlier qualifying surgery day. Same-day multiple primary operations
 ↳ cannot be distinguished by the surgery-day definition: report same_da-
 ↳ y_repeat as unavailable, never zero. Explicit time-valid KJW codes on
 ↳ operation day can still be counted as general GI reoperation.
 ↳ Reversal KJDF50/51 from 2020, band removal and mesenteric-defect
 ↳ repair are separate code-introduction descriptions only when
 ↳ specifically verified; no inferred historical crosswalk is applied.
4. Operation-clock windows are 0-30,31-90,91-365,366-1825 inclusive days.
 ↳ For each first post-entry operation in the fixed entry range, report
 ↳ first-event fraction within each window among the original operation
 ↳ cohort, before death/emigration; prior nonfatal events do not remove
 ↳ people from later-window denominators. Report recurrent counts
 ↳ separately. For repeat-primary procedures 0-30 has a day-zero
 ↳ limitation: preserve a status-only 0-30 full-repeat target and a
 ↳ measurable 1-30 later-date-repeat component. KJW early reoperations
 ↳ retain 0-30. A missing reversal definition cannot suppress
 ↳ complication or stable-repeat windows. Death/emigration fractions for
 ↳ each window are separate, with equal-day ordering D3.

5. Complication-coded hospital episodes are also described for 91-365 and
 → 366-1825; attribution weakens with elapsed time and no causal label
 → is permitted. Register hospital-treated hypoglycemia DE160*/DE161*/DE
 → 162*, malabsorption DK90*, and deficiency/malnutrition
 → DE43*/DE44*/DE46*/DE50*-DE56*/DE58*-DE61*/DE63* as separate late-safe
 → ty components, any diagnosis position in inpatient episodes after a
 → qualifying operation. These are recorded conditions, not proven surgi
 → cal sequelae, biochemical measurements or comprehensive nutrition
 → assessment. No single composite score is formed. Their baseline
 → histories are reported, not used as post-treatment exclusions.

6. Population counts include operations through the end of each calendar
 → window but events only through that end. They describe realized
 → recorded burden during that window, not a standardized post-operation
 → risk. Conditional 1825-day risk uses only the prespecified earlier op
 → eration-entry dates; newer operations are listed as administratively
 → ineligible for that fixed-clock analysis, not removed from population
 → counts. If a source code is introduced after entry, the entire
 → relevant historical conditional component is unavailable; do not use
 → a changing capture definition to compare surgery cohorts.

7. Principal stable population contrasts use index_stay_flag plus
 → postdischarge_comp within 90 days as comp_hospital, with overlapping
 → same episode counted once, and repeat_procedure split visibly into
 → later-date repeat named surgery and general KJW. If the full repeat
 → union cannot be defined comparably, mark that contrast unavailable
 → and retain each measurable component. Missing the repeat target
 → yields partial, not a complication failure. Code-introduction
 → expansions, strict index-date-excluded complication sensitivity, and
 → overlap/same-day merging are mandatory supplementary outputs; no
 → direction selects one.

8. Apply the I5 bootstrap at baseline municipality, retaining each
 → person's complete operation/event history. For conditional risks
 → resample H clusters then reconstruct the original first-operation
 → subset each draw; no nuisance fits. Report denominators as original_H
 → or first_postentry_operation_cohort and clocks calendar/operation
 → explicitly. One recipient with repeated events contributes once to a
 → first-event window fraction and all distinct episodes to the
 → recurrent count. No conditional estimates are interpreted as policy
 → effects or treated-versus-untreated comparisons.

OUTPUTS, STATES AND CHECKS

components.csv is mandatory and uses every D4 safety field: component,
 → clock, window_start, window_end, anchor, calendar_period, group,
 → stratum, denominator_type, numerator, denominator_n, person_years,
 → estimate, lower, upper, unit, mode, status, reason. Primary contrasts
 → stay in contrasts.csv. Figure 7 consumes conditional 0-30/31-90/91-36
 → 5/366-1825 potential-complication and general-GI-reoperation rows for
 → ALL, original operation-cohort denominator; extra same-day
 → limitations and exact missing reasons are visible. Table 4 contains
 → population burdens, later-date repeat procedures, attribution-limited
 → nutrition/hypoglycemia and code-introduction rows.

Synthetic: elective index-stay DT81 is retained; duplicate transfer
 → diagnoses count once; two operations with overlapping windows assign
 → an event once to the most recent prior operation; KJW after unrelated
 → GI treatment is not called bariatric revision; operation in 2019 has
 → 1825-day administrative coverage but one in 2022 does not enter the
 → fixed conditional cohort; death day 10 remains in the original
 → denominator; absent reversal codes do not block complications; absent
 → day-zero repeat information does not become no early reintervention.
 → No operation-clock point is fabricated when no operation cohort
 → exists.

EXACT FIGURE INTERFACE

The operation-clock display rows in components.csv have

```
↪ metric=window_first_event; component=potential_complication or
↪ gi_reoperation; clock=operation; group=ALL; stratum=H;
↪ anchor=first_postentry_operation; denominator_type=first_postentry_op
↪ eration_cohort; calendar_period=entry_2007_2019; period is the string
↪ 0-30,31-90,91-365,366-1825 matching integer window_start/window_end.
↪ potential_complication counts first qualifying DT81/DK91 inpatient
↪ episode in the window, including the index-stay flag in 0-30 with
↪ onset uncertainty; gi_reoperation counts first explicit KJW episode
↪ in the window. Index-stay flags contribute only to the first window.
↪ Each estimate is 1000 times the number of operation-cohort persons
↪ with at least one such window event before death/emigration divided
↪ by the original operation-cohort N, unit=events_per_1000_operations,
↪ mode=descriptive. Recurrent counts and later-date repeated primary
↪ surgery are separate table components and never silently added to the
↪ plotted first-event fraction. All eight expected rows exist even when
↪ unavailable. Figure 7 does not show an unregistered combined total.
```

Registered scientific unit

Complications and reinterventions jointly characterize the safety cost accompanying recorded operations. They belong in one safety experiment with distinct components, clocks and attribution limits. Independent component failures and early/late windows remain visible; related code lookups or models do not become separate Atoms.

Empirical results remain unfilled. Importance is high, but novelty and feasibility are limited by the failed causal identification. No study outcome is known.

Reference implementation

Entry point and supported/unresolved components for atom-000009: [execution index](#). See [engineering review](#). This pointer does not amend the registered protocol.