

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

Bolero

Abstract

Pre-data manuscript scaffold. Registered methods and planned displays are prepared; all empirical results and evidence-dependent conclusions remain unfilled.

Keywords: Registered study, results pending

PRE-DATA DRAFT: empirical placeholders are not findings.
USER-FROZEN DRAFT: packaged at user direction, not independently
scientifically accepted. No further design iterations were run.

Title

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

Abstract

Denmark tightened publicly funded bariatric referral criteria in late 2010, with contemporary national documentation dating implementation to January 2011. Prioritizing existing complications may change the balance between treating current disease and preventing future illness. We ask whether this allocation change altered long-term acute hospital burden relative to clinically prioritized patients, with separate metabolic, psychiatric, mortality and surgical-safety consequences. The intended design is a clinical-group difference-in-differences policy intention-to-treat analysis in a pretreatment clinical risk set. The public field contract does not reconstruct policy-time eligibility or establish its long-term counterfactual. This registration therefore does not authorize a causal estimator or claim a successful replacement study. It preserves an explicit identification audit and prospectively specified supplementary descriptions in a historical hospital-coded population. The audit disposition

is [[RESULT:identification]]. The historical cohort disposition is [[RESULT:cohort]]. Recorded access and health descriptions, if measurable, are [[RESULT:overview]]. A missing or unresolved result will be reported with its reason, never as statistical insignificance. The causal health consequence remains an open question under this evidence contract.

Keywords

Registered study; results pending.

Introduction

Publicly funded surgery is an allocation decision as well as a treatment decision. Eligibility based on existing complications can concentrate treatment among people with immediate clinical need, while restricting access among people who might benefit from prevention. It can also release capacity for prioritized patients. These mechanisms make relative access and subsequent health important to study, but they complicate the meaning of an apparently untreated comparator.

Denmark provides a consequential institutional setting. The December 2010 Government/Danske Regioner circular changed referral criteria and emphasized medical assessment; the contemporary national audit dates the new rules to 1 January 2011. Those documents establish a policy change, not a clinical treatment assignment observed in our data. Historical obesity diagnoses, recorded conditions and medication purchases are not complete contemporaneous BMI and surgical-suitability assessments. This difference between the policy's clinical rule and the register's observable constructs is central to the proposed study.

Existing research sharply limits broad novelty claims. Borisenko and colleagues already examine Danish commissioning and aggregate bariatric utilization. Bøgelund and colleagues already use Danish difference-in-differences for healthcare and labor outcomes, with controls selected to undergo surgery six years later. Larsen and colleagues also study socioeconomic and healthcare outcomes. In Sweden, SOS research examines diabetes prevention and surgical eligibility, while Memarian and colleagues use historical BMI to investigate socioeconomic access. Danish studies cover diabetes remission, psychiatric treatment and mortality; newer Nordic studies extend cardiovascular and mortality follow-up. These studies motivate the endpoints but cannot supply this design's policy-time denominator or its counterfactual.

The intended addition is a health effect of policy-assigned access in a population defined before treatment, rather than another comparison selected on eventual surgery. That addition is not realized merely by attaching long-term outcomes to a national before/after series. We retain the question and its necessary evidence conditions explicitly, alongside a complete prospective outcome plan. Descriptive evidence may clarify measurable clinical trajectories, but it cannot be advertised as answering the causal allocation question.

Institutional setting and theory

The primary 2010 circular specifies a lower referral age of 25, BMI above 35 with specified disease, and exceptional individual consideration above BMI 50 without comorbidity. There is no hard upper age limit. It requires clinical suitability and prior conservative treatment, beyond a diagnosis code. The circular is dated 17 December; the first public announcement of final thresholds has not been established. Its medical pathway can affect treatment and detection independently of surgery. [Government/Danske Regioner circular](#).

Contemporaneous institutional changes threaten a simple clinical-group comparison. The audit documents the earlier age change in 2008, the temporary suspension of extended free hospital choice in 2008–2009 and specialty reorganization in 2011. Regional procurement responses do not establish exogenous clinical adoption dates. Contemporary January implementation evidence is stronger than the conflicting retrospective July 2011 wording in the 2017 guideline, whose own replacement date is July 2017. Announcement, grandfathering and complete regional implementation remain separate unresolved items. [Rigsrevisionen](#); [SST visitation guideline](#).

The economic tradeoff is between current clinical priority, future health gain and scarce treatment capacity. The biomedical pathways may differ over time: recorded surgical complications can arise immediately, whereas diabetes progression and cardiovascular disease may develop over years. Medical optimization and psychiatric assessment can change care without surgery. Mortality and migration also alter opportunities for later recorded events. Neither fewer admissions nor fewer prescriptions alone establishes a net welfare improvement or clinical remission.

Data and population

The proposed data sources are the allowed FSV population, migration, hospital, pharmacy, psychiatric and death tables. Exact fields, documented vintages and code definitions are specified in the shared data contract and member protocols. Documentation is not proof of runtime availability, successful linkage, sample size, overlap or event frequency. No study data have been accessed for this manuscript.

The intended clinical groups would require severe obesity and suitability measured before policy exposure. That mapping is unsupported here. For supplementary descriptions only, H is a fixed historical clinical population resident and alive on 1 January 2007, aged 25–59 on 1 January 2011, with a main or secondary DE660D-coded hospital contact in 2005–2006 and verified continuous residence in 2003–2006. Birth date determines age; no subsequent surgery, referral, pregnancy, residence or survival is required. Prior surgery is not excluded from H. The historical code is not a strict reform-time BMI band.

R=1 denotes recorded conditions resembling the clinical domains named by the policy; R=0 denotes no such record in the frozen hospital history. These labels do not mean retained eligibility or uncomplicated obesity. The disease-free diabetes stratum F additionally requires complete hospital, pharmacy and residence histories in 1996–2006 and no prior diabetes, obstetric-diabetes code or A10 dispensing. T requires recorded type-2 diabetes without type-1 conflict. Uncertain histories remain uncertain.

In particular, pre-existing diabetes in pregnancy is not misclassified as gestational diabetes, and metformin-only use is not assumed diagnostic of type-2 diabetes.

Selection through hospital care can connect historical clinical severity, age, resources and care seeking even when selection precedes the policy. Results cannot generalize automatically to all Danish adults with severe obesity. Maternal BMI and later generic result fields do not repair this policy-time population. No laboratory outcomes, referral assessments or unlisted clinical registry are silently added.

Identification and analysis

The intended policy estimand is the difference between the policy effects in otherwise suitable patients losing the uncomplicated BMI route and those with retained clinical indications. Both groups may be affected. The estimate would not identify either group's absolute effect, and the surgery effect would require additional complier and exclusion assumptions. Neither eligibility reconstruction nor a credible long-term clinical-group no-policy trend is supplied. Consequently this registration has no positive causal activation state, causal DiD coefficient or surgery IV. A favorable operation difference or pre-period profile cannot reverse the boundary.

Supplementary estimates concern recorded domestic events before death or first emigration under actual policies. Original baseline denominators remain fixed. Emigration is a competing event defining this narrower target, not assumed independent censoring; observation does not resume after return. Count valid death-day hospital events before death, give death precedence over same-day emigration, and exclude date-only emigration-day healthcare events without evidence of earlier occurrence. Missing delivered calendars are unavailable, never zero.

We report annual trajectories from 2007 through 2024 and fixed periods: 2007–2009, 2010, 2011, 2012–2015 and 2016–2024. For recurrent outcomes, period rates divide recorded counts by the original group population and calendar duration. The fixed descriptive difference in changes compares the R0-minus-R1 long-period gap with its 2007–2009 gap. It is associational, not a policy effect. The disturbed 2008–2009 reference regime and later clinical progression remain interpretation limits. We do not choose a reference period after seeing trends.

Diabetes and mortality use cumulative first-event fractions through fixed landmarks, with death, emigration and competing diabetes types handled explicitly. A reduction in a late diagnosis flow can arise because diagnoses occurred earlier; we therefore do not label late flows prevention or survival effects. Recorded diagnoses measure recognition in care, not exact biological onset. Pretrends that are zero by construction are not used as evidence of comparability.

All-cause and cardiovascular acute inpatient episodes use a consistent transfer-merge rule and verified inpatient/acute mappings. Emergency-only visits are excluded; elective index-stay complications are retained separately in safety. The 2014 emergency coding change and the 2019 LPR transition are checked within each affected experiment. Invalid continuity prevents a cross-era contrast without erasing earlier valid descriptions. Medication outcomes count dispensing months, not doses, adherence or days covered. Psychiatric outpatient pathways supply contact starts, not inferred repeated visits.

Uncertainty is pointwise and descriptive. A prespecified baseline-municipality bootstrap resamples complete person histories 9,999 times, recomputing numerators, original denominators and contrasts. These intervals describe a repeat-cohort model conditional on national shocks; they do not estimate national-policy assignment uncertainty. Small cluster support, undefined replicates or degenerate event information produces an unavailable interval and no directional verdict. No confirmatory causal tests, p-values, equivalence claims or common health index are registered. All metrics and unavailable positions remain reported; no outcome selects later hypotheses or a preferred specification.

Safety uses both original-population and operation clocks. Population burdens retain people who never undergo surgery. Conditional descriptions follow first recorded post-entry operations within a fixed date range that permits up to 1,825 days of administrative follow-up, without requiring survival or continued residence. The conditional population is selected on treatment and has no causal recipient comparison. Potential complication codes on elective index stays have uncertain onset; later complication-coded admissions do not prove surgical attribution. General gastrointestinal reoperations are not automatically bariatric revisions. Code introductions and indistinguishable same-day repeated primary procedures receive explicit unavailable targets rather than historical zeros.

Results - registered reporting text and displays

The following slots are the only unfilled empirical content. Each resolves to a complete result statement under the registered output and status rules. Conditional interpretation is fixed here and in the Molecule; it does not authorize narrative selection.

Identification and population. The source audit will report `[[RESULT:identification]]`. A `not_identified` disposition means the intended causal question is unanswered. Otherwise or `no_result` means the audit is unresolved or operationally incomplete, without permitting causal estimation. Historical population flow and descriptive clinical composition are `[[RESULT:cohort]]`. `Historical_ready` permits only the defined H descriptions; a cohort boundary or `no_result` leaves dependent empirical units `not_activated`. Table 1 reports flow, recorded clinical groups and baseline composition. Figure 1 presents the source-predicate status table, including exact unresolved reasons.

Access. Captured operation access is `[[RESULT:access]]`. Lower or higher denotes the fixed descriptive group-gap change; neither denotes a policy first stage. An unresolved interval does not show that access was unchanged. Partial results retain public-recorded or stable-code scope, with payer, private reporting and diabetes-stratum limits named separately. Table 2 includes cumulative first post-entry surgery and F/T access where measurable. Figure 2 shows annual named-operation rates, with the reference/transition/long-period context visible.

Physical hospital burden. The acute hospital results are `[[RESULT:hospital]]`. If all-cause and cardiovascular directions oppose, the result is a discordant morbidity/utilization pattern. If only one is measurable, the other remains unavailable,

without a uniform health conclusion. Lower recorded acute admissions do not establish policy benefit or net welfare. Severe cardiovascular endpoints may provide little precision; unknown frequency is not filled from age or published cohorts. Figure 3 shows separate all-cause and cardiovascular panels; Table 3 retains heart-failure decomposition and registered coding sensitivities.

Metabolic outcomes. Cumulative recorded type-2 diabetes in F is [[RESULT:diabetes_incidence]]. A lower cumulative fraction cannot distinguish prevention from competing exits or changed recording, and cannot establish a causal surgery-access pathway. Prevalent-diabetes treatment burden is [[RESULT:diabetes_burden]]. Lower dispensing with higher hospital burden is reported as discordance, not remission. Drug-source failure leaves independently measurable inpatient burden visible. Figure 4 presents cumulative diabetes and mortality in separate panels with distinct populations; Figure 5 separates medication months from inpatient episodes.

Psychiatric care. Psychiatric treatment and recorded self-harm are [[RESULT:psychiatric]]. Opposing treatment-contact and harm directions are retained separately. More contacts can reflect detection or better access as well as illness; fewer contacts need not mean improved wellbeing. Alcohol admissions and psychotropic dispensing remain distinct Table 3 components. Missing psychiatric mapping does not erase independently measured somatic self-harm. Figure 6 displays principal contact-start and self-harm patterns.

Mortality. Cumulative domestic recorded all-cause death is [[RESULT:mortality]]. The estimate concerns the original historical cohort before first emigration, not a hypothetical mortality effect among people who would always remain resident. Death increments and migration fractions accompany the cumulative description. Mortality remains independently reportable when other clinical sources fail. An imprecise or unavailable interval is not evidence of harmless access restriction.

Safety. Population and operation-clock safety are [[RESULT:safety]]. Fewer population complications can accompany fewer captured operations; this does not estimate a lower complication risk per operation. General gastrointestinal reoperations and specifically named repeat procedures are labeled separately. Index-stay diagnoses have uncertain temporal attribution, and missing historical reversal or day-zero repeat information is explicit. If one safety component fails, other measured components remain reported. Table 4 separates clocks, original denominators, early/late windows, nutrition/hypoglycemia and code-introduction components. Figure 7 displays conditional window-specific potential-complication and general-GI-reoperation fractions with exact unavailable reasons.

Discussion

The central interpretation is constrained by the difference between a clinical allocation rule and its observable register proxies. If the audit resolves not_identified, it establishes why this field contract cannot estimate the requested policy effect; it does not show that the policy had no effect. If the audit cannot be completed, uncertainty remains explicit. In neither case can numerical descriptions or well-behaved pre-period

profiles confer causal identification. The result-dependent extent of available evidence is [[RESULT:overview]].

The potential clinical tradeoff remains meaningful. Prioritizing existing disease can affect prevention and current treatment differently, and surgical exposure itself creates short- and long-term safety burdens. The outcome plan preserves these distinctions without collapsing them into a health index. A mixed result is informative about recorded clinical patterns, but it does not identify the policy mechanism or its welfare consequences.

Historical selection, unknown clinical suitability, private capture, changing surgical procedures, institutional disturbances and the LPR transition limit interpretation. Prior art prevents broad claims of being the first Danish bariatric DiD, reform analysis, psychiatric safety study or Scandinavian long-term-health follow-up. A new contribution would require credible policy exposure and comparison evidence. Such evidence would require a new reviewed registration; it cannot be supplied by post-treatment selection, an invented BMI mapping or a significance-based branch.

Ethics, transparency and availability

This is a public-documentation-stage manuscript. No person-level data or study estimates have been accessed, and no simulated empirical plots are included. Runtime linkage, analysis and aggregate disclosure require the appropriate governed permissions. Code and public-safe definitions can be shared; confidential records cannot. Funding, institutional affiliations and conflicts have not been supplied and must be completed administratively before submission. These administrative disclosures do not authorize scientific redesign. Full source/query/access ledgers, protocol boundaries and plotting interfaces accompany the registration. All registered units, including unactivated and failed units, remain visible.

Checked references

Institutional sources are linked above. Detailed access levels and claim scopes are in docs/sources/literature.md. The following references identify the primary scientific prior art; abstract-only access is not represented as full-text verification.

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- Callaway and Sant’Anna (2021). Difference-in-Differences with Multiple Time Periods. Journal of Econometrics 225(2), 200–230. doi:10.1016/j.jeconom.2020.12.001. Author-paper discovery checked; used as a requirement for any newly justified staggered design, not an estimator executed here.

Identification evidence and unresolved predicates
Registered display; reviewed results not yet available.

Fig. 1 Source-predicate statuses for the intended Danish policy ITT. Audit disposition: [[RESULT:identification]]. This is a documentary display, not a treatment-effect estimate or another authoritative experiment graph.

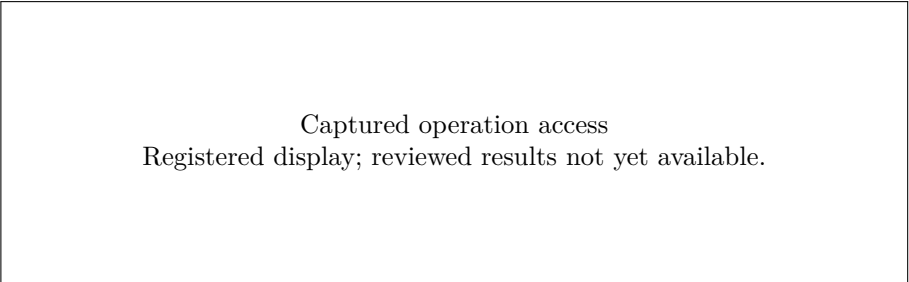


Fig. 2 Annual captured named-operation rates in historical clinical groups. `[[RESULT:access]]`. Denominators are original H, not recipients or survivors. Dashed lines locate national policy dates without attributing the trajectories to them.

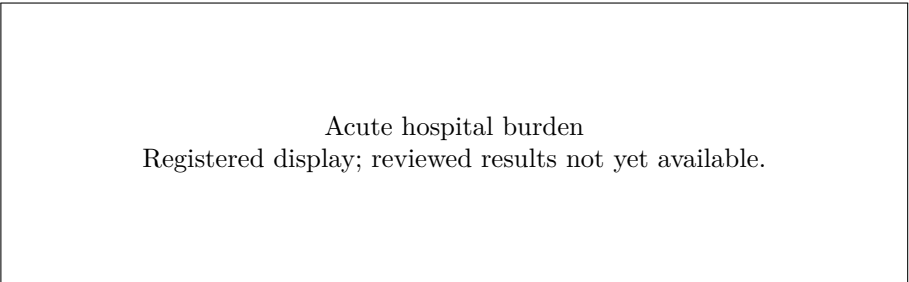


Fig. 3 All-cause and cardiovascular acute inpatient episodes, shown separately. `[[RESULT:hospital]]`. Next-day transfers are merged. Both series use original H denominators; no common health score or causal interpretation is plotted.

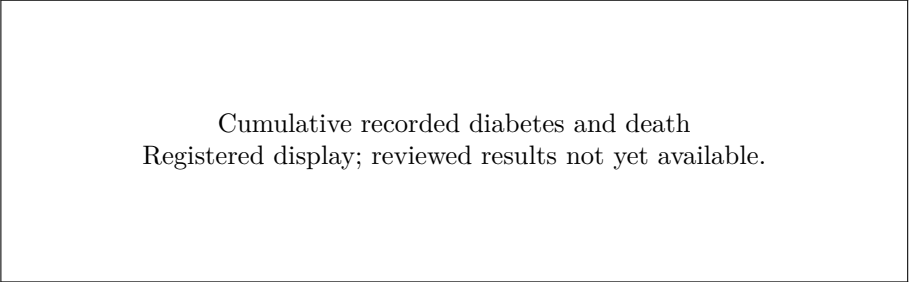


Fig. 4 Cumulative recorded type-2 diabetes in F and cumulative all-cause death in H, on separate scales. `[[RESULT:diabetes_incidence]]` `[[RESULT:mortality]]`. Both retain original denominators and end domestic observation at first emigration; the diabetes process has additional competing disease/death exits.

Treatment burden in prevalent diabetes
Registered display; reviewed results not yet available.

Fig. 5 Dispensing-month and inpatient-episode burdens in baseline T, with distinct units and original denominators. [[RESULT:diabetes_burden]]. Dispensing reduction is not clinical remission or improved adherence.

Psychiatric care and recorded self-harm
Registered display; reviewed results not yet available.

Fig. 6 Psychiatric contact starts and intentional self-harm inpatient episodes are separate outcomes. [[RESULT:psychiatric]]. Contact starts are not outpatient visit counts or a measure of latent wellbeing. Exact source and missing-period limits accompany each panel.

Operation-clock safety
Registered display; reviewed results not yet available.

Fig. 7 Window-specific first-event fractions after first recorded post-entry operation, among the fixed 2007-2019 operation cohort. [[RESULT:safety]]. Original operation-cohort denominators include deaths and emigrants as competing events; index-stay complication timing is uncertain. General gastrointestinal reoperation is not specifically bariatric revision. Conditional descriptions are not policy effects.