FINAL PROJECT REPORT

Project Title: Swiss Regional Heterogeneity of Vaccination Values and Beliefs Phase II and Phase III

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1. EXECUTIVE SUMMARY

This report documents the implementation and outcomes of the project "Swiss Regional Heterogeneity of Vaccination Values and Beliefs Phase II and Phase III," conducted by Swiss Tropical and Public Health Institute under contract with the Federal Office of Public Health (BAG/FOPH). The project generated new evidence on maternal vaccination communication in Switzerland and developed a practical training tool to support healthcare providers in vaccine counseling during pregnancy, directly advancing Switzerland's National Vaccination Strategy goals.

Project Purpose and Objectives

The project employed a research-cum-action methodology combining empirical research with practical intervention development. Phase II focused on evidence generation through two complementary assessments: a qualitative needs assessment of prenatal healthcare providers examining their experiences, training, and communication practices regarding maternal vaccination, and collaboration with the Swiss Infant Feeding Study (SWIFS) 2024 to assess pregnant women's experiences with maternal vaccination advice and vaccine uptake. Phase III focused on adapting an evidence-based tiered communication training for use in Switzerland and disseminating it to prenatal care physicians.

Key Activities

The healthcare provider needs assessment involved semi-structured interviews prenatal healthcare providers, including both midwives and gynecologists. Interviews explored providers' education in vaccination and communication, organization of prenatal vaccination services, communication approaches used with pregnant patients, and support needed for effective vaccine counseling.

The maternal vaccination assessment integrated questions into SWIFS 2024, a nationally representative survey of 1,269 postpartum women across all Swiss language regions. The survey assessed whether mothers received vaccination advice during pregnancy, their uptake of influenza and pertussis vaccines, and reasons for accepting or declining vaccination.

Based on findings from both assessments and feedback from 18 participants at the National Vaccination Strategy Workshop in June 2024, the project team adapted the MI4MI (Motivational Interviewing for Maternal Immunization) training developed by Prof. Dr. Sean T. O'Leary at the University of Colorado for use in Switzerland. The adaptation involved substantial modifications to ensure cultural appropriateness, particularly regarding presumptive communication approaches. The final 3-part asynchronous online training in German was completed in October 2025 and distributed to gynecologists in German-speaking Switzerland through professional networks.

Main Findings

The healthcare provider assessment revealed critical insights into professional identity differences between midwives and gynecologists that shape vaccine counseling. Midwives emphasized patient autonomy and informed choice, often avoiding personal recommendations, with several reporting they were taught that vaccine recommendation was "not their responsibility." In contrast, gynecologists positioned themselves as active vaccine advocates from a public health perspective. Both groups reported receiving general communication training but no specific training on vaccine communication or addressing vaccine hesitancy.

The SWIFS 2024 collaboration provided the first nationally representative data on maternal vaccination in Switzerland. While 85% of mothers reported receiving vaccination advice during pregnancy, uptake varied substantially by vaccine: 70% received pertussis (Tdap) vaccination during pregnancy compared to only 22% for influenza vaccination.

Both assessments converged on an important finding: healthcare provider recommendation is the single most powerful driver of maternal vaccine acceptance, with 82-91% of vaccinated mothers citing provider recommendation as a key motivator. Conversely, lack of provider recommendation was cited by 32-43% of non-vaccinated mothers.

Project Outputs

The project successfully produced multiple deliverables: two major research reports (Master's monograph documenting the healthcare provider needs assessment, SWIFS 2024 final report including maternal vaccination findings); two research datasets with secure long-term storage; survey instruments (healthcare provider interview guide, SWIFS maternal vaccination questions translated to four languages); one complete 3-part tiered communication training tool in German hosted on publicly accessible platforms (YouTube and Genially); training distribution materials; and a manuscript in preparation for submission to Swiss Medical Weekly analyzing SWIFS maternal vaccination data in greater depth.

Dissemination activities included presentations at two National Vaccination Strategy Workshop sessions in June 2024 with 18 participants providing feedback, and distribution of the completed training to gynecologists in German-speaking Switzerland through professional networks in October 2025. The project established productive collaborative partnerships with the SWIFS research team at ZHAW and Swiss TPH, and with Prof. Dr. Sean T. O'Leary's MI4MI team at the University of Colorado.

Key Conclusions and Recommendations

The tiered communication training developed through this project provides prenatal care physicians with evidence-based techniques for initiating vaccine discussions using culturally adapted presumptive approaches and employing motivational interviewing when patients express hesitancy.

Midwives face both substantial knowledge gaps (vaccination described as marginal in their education, no confidence addressing hesitancy) and professional identity barriers (viewing neutral, non-directive stance as appropriate practice). These barriers cannot be addressed through communication skills training alone but require foundational vaccine education and professional role reconceptualization.

The project recommends further evaluation and refinement of the tiered communication training with physician end-users, followed by professional production of final versions in German, French, and Italian for inclusion on the E-VACTS platform.

Future work should focus on midwives' distinct training needs, addressing both foundational vaccine knowledge and reframing promotion of maternal vaccination as a core component of high-quality prenatal care compatible with midwives' professional values.

2. PROJECT BACKGROUND AND CONTEXT

2.1 Original Project Design

The project was initially conceived in 2020 as a three-phase research-cum-action initiative titled "Engaging with antenatal care providers to conduct vaccination counseling with expectant parents." The original design, submitted under the leadership of Dr. Machteld van den Berg with supervision from PD Dr. Sonja Merten at Swiss TPH, represented an innovative approach to addressing vaccine hesitancy by targeting the antenatal period as a critical window of opportunity for intervention.

Foundational Rationale

The project was grounded in several key insights from the vaccination communication literature. HCPs, particularly those in antenatal care, serve as the most trusted and influential sources of vaccination information for expectant parents. In addition, vaccine decision-making begins during pregnancy, when parents are actively forming their positions on childhood vaccination and are most receptive to evidence-based information. However, Swiss HCPs had reported feeling ill-equipped to address vaccination concerns, creating a gap between parental information needs and available support.

The project aligned directly with Switzerland's National Vaccination Strategy goals: encouraging stakeholders to prioritize vaccination, ensuring the public can make informed decisions, and simplifying access to vaccination information. Given Switzerland's significant cantonal variance in vaccination coverage—linked to regional autonomy and contextual differences—the project aimed to develop tools that could be tailored to diverse local needs while maintaining scientific rigor.

Three-Phase Design

The original project structure comprised three distinct but interconnected phases spanning June 2019 through May 2022:

Phase I (June 2019 - May 2020) focused on conducting a needs assessment among antenatal care providers using qualitative semi-structured interviews with obstetricians and midwives affiliated with major Swiss hospitals across German-, Italian-, and French-speaking cantons. Early findings indicated that providers were generally receptive but emphasized the importance of respecting their time constraints and providing access to clear, concise information.

Phase II (June 2020 - May 2021) was designed to co-create and implement an evidence-based communication tool through an iterative process with antenatal care providers. The tool design would draw on communication science principles and incorporate evidence-based approaches such as motivational interviewing and presumptive

communication, both of which had demonstrated effectiveness in promoting vaccine uptake.

Phase III (June 2021 - May 2022) aimed to measure the communication tool's impact on vaccine confidence among expectant and new parents. The study was designed to detect changes in vaccine confidence (primary endpoint), decisional conflict, and patient experience. Based on power calculations assuming 40% provider participation across three hospitals and accounting for clustering effects, the study aimed to recruit 409 participants to detect a 0.5-point increase in mean Likert scores on a 10-point scale with 80% power.

2.2 Impact of COVID-19 Pandemic

The onset of the SARS-CoV-2 pandemic in May 2020 significantly disrupted this plan, leading to an end to the initial project during Phase 1. Before this interruption, the research team conducted 10 in-depth, semi-structured interviews with antenatal care providers (4 midwives and 6 gynecologists) practicing in major Swiss hospitals across the cantons of Bern, Basel, Basel-Land, and Vaud.

Interviews highlighted several points. Firstly, antenatal care providers demonstrated general receptiveness to providing childhood vaccination counseling to pregnant women. Both gynecologists and midwives recognized the need for trusted sources of vaccine information for expectant parents. While they acknowledged that pediatricians held primary responsibility for childhood vaccinations, many viewed pregnancy as an opportune time to sensitize parents to both maternal and childhood vaccine information. However, more experienced midwives (practicing over 20 years) reported minimal to no vaccine-related training and expressed feeling ill-equipped to address vaccination questions or concerns.

Providers emphasized the importance of an open, non-forceful communication approach. The most consistently emphasized barrier was heavy time constraints in provider schedules. Respondents stressed the need for streamlined methods that could be efficiently integrated into existing clinical workflows.

Some providers suggested coupling childhood vaccination discussions with maternal pertussis vaccination counseling, as expectant parents showed less resistance to pertussis vaccination (viewing it as protecting the baby) compared to seasonal influenza vaccination. This link could help introduce similar concepts and facilitate conversation about childhood vaccines.

Providers stressed that vaccination counseling should be tailored to individual couples or expectant mothers. Providers identified different groups among expectant parents: some who refuse vaccines during pregnancy but accept childhood vaccines, others who

refuse all vaccines, and some who request alternative scheduling or selective vaccination. This heterogeneity reinforced the need for tailored approaches.

Respondents also repeatedly emphasized the critical importance of harmonizing messaging between midwives and gynecologists to ensure expectant parents receive consistent information from all antenatal care providers.

The COVID-19 pandemic brought the interview process to an abrupt halt in March 2020, preventing completion of planned interviews with additional providers, including those in Italian-speaking regions. Hospital access restrictions made it impossible to continue the research as originally designed. Despite this premature conclusion, the preliminary findings provided valuable insights that informed the project's subsequent redesign and adaptation for the 2023-2025 implementation period.

2.3 Project Adaptation and Redesign (2023)

In 2023, the project was renewed and adapted under new leadership. Project leadership transitioned from Dr. Machteld Wyss-van den Berg to Dr. Kristen Jafflin (MA, PhD in sociology). The project was retitled "Swiss Regional Heterogeneity of Vaccination Values and Beliefs Phase II and Phase III."

The adapted project maintained three core objectives but substantially revised their methods.

Objective I replaced qualitative interviews with HCPs with two complementary approaches: (1) a needs assessment prenatal HCPs examining their experiences, practices, and needs regarding vaccination counseling, and (2) a Rapid Assessment Survey (RAS) of pregnant women to assess their vaccine confidence, experiences, beliefs, and information needs across different regions.

Objective II expanded the evidence base for tool design beyond provider needs. The communication tool would draw on findings from both the HCP needs assessment and the patient RAS, incorporating evidence-based strategies including motivational interviewing. Critically, the tool would be explicitly designed to accommodate local needs identified through assessment of regional variation.

Objective III evolved to comprehensive impact assessment examining vaccine confidence (primary endpoint), patient satisfaction, actual vaccine uptake, and HCP confidence and satisfaction. The proposal incorporated both qualitative interviews with providers and quantitative patient surveys using the validated Vaccine Confidence Index (VCI), enabling rigorous before-and-after comparison.

2.4 Relevance to National Vaccination Strategy (NSI)

The redesigned project maintained strong alignment with Switzerland's National Vaccination Strategy (NSI) and its three core objectives, while adapting its approach to address the post-pandemic vaccination landscape.

Alignment with NSI Goal 1: Stakeholder Commitment to Vaccination

The first NSI objective aims to encourage stakeholders, particularly HCPs, to recognize vaccinations as essential for population health and to provide consistent, unified information. The project directly supported this goal by addressing a critical gap identified in Swiss research: HCPs' self-reported lack of confidence and preparedness in addressing patient vaccination concerns.

Alignment with NSI Goal 2: Public Trust and Informed Decision-Making

The second NSI objective focuses on ensuring the public can make informed vaccination decisions based on adequate understanding and trust in official recommendations. The project's dual focus on both HCPs and pregnant women directly addressed this goal. The project's emphasis on pregnant women as a target population is particularly strategic for this NSI goal. Research demonstrates that vaccination attitudes and decisions begin forming during pregnancy, meaning interventions during this period can shape not only maternal vaccine uptake but also parents' subsequent attitudes toward childhood vaccination.

Alignment with NSI Goal 3: Simplified Access to Information and Vaccinations

The third NSI objective emphasizes making it easy for the population to access clear, transparent vaccination information. The project contributed to this goal by creating resources specifically designed for integration into routine clinical workflows during pregnancy—a period when women already have regular healthcare contact.

3. PROJECT OBJECTIVES

3.1 Overall Project Goal

The overarching goal of this research-cum-action project was to design and implement a tailored communication tool aligned with the Swiss National Vaccination Strategy to support vaccine coverage in Switzerland. Specifically, the project aimed to support patients and caregivers in making informed, autonomous vaccination decisions by strengthening the capacity of HCPs to engage in effective vaccination counseling during pregnancy.

The project recognized that addressing vaccine hesitancy requires evidence-based, empirically driven approaches tailored to patients' attitudes and concerns.

3.2 Specific Objectives for Phase II (June 2023 - May 2024)

Phase II focused on evidence generation and initial tool adaptation through two complementary research activities:

Objective 1: Assess HCP Experiences and Needs with Maternal Vaccination Counseling

Research Question: What are HCPs' experiences with vaccination counseling for pregnant women, and what support do they need?

The project conducted in-depth semi-structured interviews with prenatal HCPs to explore not only what practices and needs exist, but also the underlying professional identities, training experiences, communication approaches, and contextual factors shaping vaccine counseling behaviors.

Objective 2: Assess Pregnant Women's Attitudes and Experiences with Maternal Vaccination

Planned Research Approach

The original Phase II proposal planned to conduct a Rapid Assessment Survey (RAS) specifically designed for this project. The RAS would be administered as a brief survey to pregnant women immediately following medical consultations regarding maternal vaccination at participating maternity centers across Switzerland.

Research as Actually Conducted

During the project implementation period, an opportunity arose to collaborate with a large-scale national monitoring study that aligned closely with the project's research objectives. The Swiss Infant Feeding Study (SWIFS) 2024, a population-based cross-sectional survey mandated by the Federal Food Safety and Veterinary Office, was being conducted during the same timeframe (August-December 2024). SWIFS 2024 surveyed

postpartum women with infants aged 0-12 months about infant feeding practices, maternal health behaviors, and preventive care. The project team coordinated with the SWIFS 2024 investigators to add targeted questions about maternal vaccination to the established national survey, allowing a representative survey examining women's experiences with maternal vaccination. This approach offered several advantages: access to a larger, nationally representative sample; integration with a well-established monitoring framework with proven methodology; and cost-effectiveness through resource sharing.

Objective 3: Synthesis and Tool Adaptation

The culminating activity of Phase II involved synthesizing findings from both the HCP needs assessment and the patient RAS to inform creation or adaptation of a communication tool. This synthesis involved:

- Assessing existing tools to identify any that might be relevant to project goals,
- Identifying or creating a tool for evaluation,
- Evaluating acceptability of the tool through analysis of findings from the HCP Needs Assessment and SWIFS survey,
- Adapting or creating a tool for testing.

Our assessment of existing tools adapted to our project goals identified one technique that was particularly promising: tiered communication. Scientific research on vaccine communication highlights the utility of tiered communication techniques, which include use of presumptive approaches to introduce vaccine discussions and motivational interviewing when communicating with hesitant patients, as an important communication technique to improve provider-patient vaccine communication with diverse patient populations.

3.3 Specific Objectives for Phase III (April 2025 - November 2025)

Phase III focused on tool finalization, implementation, and impact assessment:

Objective 1: Finalize Communication Tool

Based on research from Phase II, we adapted the identified training for use and testing in the German-speaking part of Switzerland. This involves some key changes in phrasing and emphasis, particularly regarding the use of presumptive approaches.

Finalizing the tool involved the following tasks:

- Transcription and adaptation of the original training,
- Translation of the adapted training,
- Recreation of training slides and videos,

- Recreation of training exercises.

Objective 2: Disseminate and Test Communication Tool

We launched the tool through dissemination to gynecologists working in the German-speaking part of Switzerland, inviting them to test the tool and provide their feedback. We arranged a focus group feedback session after the launch, inviting gynecologists to attend. Unfortunately, no one was able to attend the session, and due to time constraints, we were unable to offer another opportunity to provide feedback.

Objective 3: Assess Tool Impact on Multiple Outcomes

Primary Aim: Demonstrate that the communication tool, when used by HCPs in combination with brief patient consultation, improves vaccine confidence among pregnant women compared to standard practices.

Due to limitations in time, we were unable to complete a full assessment of the tool's impact.

4. METHODOLOGY

4.1 Overall Research Design

This project employed a research-cum-action methodology combining empirical research with practical intervention development and implementation. The design comprised three sequential but interconnected phases: evidence generation through HCP and patient assessments (Phase I and Phase II), tool adaptation and implementation (Phase II and Phase III), and impact evaluation (Phase III).

The overall study employed a mixed-methods approach, integrating:

- Quantitative surveys of pregnant women to systematically document experiences, practices, attitudes, and regional variations,
- Qualitative interviews with HCPs to assess needs, explore implementation experiences and gather in-depth feedback on tool utility,

The research took place across multiple Swiss cantons representing German-, French-, and Italian-speaking regions to capture Switzerland's linguistic and cultural diversity.

4.2 HCP Needs Assessment

The qualitative assessment employed semi-structured interviews with HCPs working in prenatal care in German-speaking regions of Switzerland. The research was conducted as part of a medical Master's thesis project between April and December 2024. The interview guide explored four key domains:

1. participants' education in vaccination and communication,
2. the organization of maternal care and prenatal vaccination services,
3. the approaches and techniques used to communicate about vaccines with pregnant patients, and
4. needs regarding vaccine communication.

Recruitment employed multiple strategies: direct telephone contact with potential participants, email recruitment letters, and snowball sampling. Purposive sampling ensured diversity across professional training (midwives and gynecologists), work settings (hospitals, private practices, and independent contractors), and geographic locations (urban and rural areas). Of 68 HCPs contacted, eight agreed to participate, five midwives and three gynecologists. The five midwives included two working in urban settings (one hospital, one practice) and three in rural settings (one practice, one hospital, one hospital and self-employed). All three gynecologists worked in urban settings (two in private practices, one in a hospital).

Interviews ranged from 11 to 37 minutes and were conducted in person, online via Zoom, or by telephone according to participant preference. A medical Master's student trained in qualitative interview methods conducted all interviews. Interviews were audio-recorded, transcribed verbatim, and anonymized immediately. Data analysis employed combined inductive and deductive thematic analysis using MAXQDA 24 software. An initial coding framework derived from the interview guide and relevant literature was iteratively refined through immersion in the data, followed by theme review and definition, and a second round of coding with the finalized framework.

4.3 Pregnant Women/New Mothers Research

Study Design and Sample

SWIFS 2024 employed a rigorous sampling methodology. The Swiss Federal Statistical Office (FSO) drew a random sample of 4,040 mothers stratified by infant age groups (0-3 months, 4-6 months, 7-9 months, and 10-12 months) and language region (German-, French-, and Italian-speaking) from the population registry sampling frame. Mothers received postal invitations to participate in an online survey, with two reminder mailings. Due to the time elapsed between sample selection and survey administration, the final analytical sample comprised 1,269 mothers (34% response rate) with infants aged 3-14 months at the time of survey completion. The sample represented all Swiss regions, with 78% from German-speaking, 19% from French-speaking, and 3% from Italian-speaking Switzerland.

Vaccination Questions Added to SWIFS 2024

The project contributed specific questions to SWIFS 2024 addressing maternal vaccination experiences and attitudes. Mothers were asked whether they received

advice on vaccination during pregnancy, whether they were vaccinated against influenza and pertussis (Tdap) during their most recent pregnancy, and their reasons for either receiving or not receiving these vaccines. Multiple response options allowed mothers to select various reasons for their vaccination decisions.

Limitations of the Adapted Approach

While the collaboration with SWIFS 2024 provided valuable data, it imposed certain constraints compared to the originally planned RAS. The survey instrument was limited to a small number of vaccination-specific questions that could be integrated without substantially lengthening the SWIFS questionnaire, precluding detailed assessment of vaccine confidence using validated scales such as the Vaccine Confidence Index.

4.4 Tool Identification and Adaptation

We carried out a review of existing vaccine communication tools, which identified tiered communication as a promising approach in the Swiss context. Given the evidence of their efficacy and the existence of tiered communication trainings specifically for vaccination during pregnancy, we identified these trainings as excellent candidates for adaptation for use in Switzerland in the context of this project, and we contacted the research team that developed the training specifically for maternal vaccination, led by Prof. Dr. Sean T. O'Leary at the University of Colorado. The team agreed to collaborate with us and shared their training materials. We determined that the 3-hour online asynchronous training was a good candidate for adaptation in the context of this project, and we adjusted the interview guide for the HCP Needs Assessment to specifically examine the appropriateness of the approach taught with this tool.

We adapted the tool based on the analysis of findings from the HCP Needs Assessment and the SWIFS survey. In addition, in June 2024 we had the opportunity to present the approach at two workshops at the National Vaccination Strategy Workshop in Bern. A total of 18 workshop attendees participated in the workshops, sharing their feedback on the appropriateness of the tool and adaptations needed for its use in Switzerland.

Based on findings from this research, we adapted the training for use in Switzerland. This particularly involved adaptation in the use of presumptive approaches. Once adapted, we developed an asynchronous online training for testing in German.

4.5 Ethical Considerations

The original Phase I study protocol, informed consent forms, and interview guide were reviewed and exempted from full review due to minimal risk by Ethikkommission Nordwest- und Zentralschweiz (EKNZ). The adapted Phase II and III protocol assessing health care workers experiences was also exempt from full review by the EKNZ. The research on patients' attitudes and experiences with maternal vaccination was able to

be coordinated with the Swiss Infant Feeding Survey (SWIFS), which surveyed postpartum women. This survey was exempted from full ethics review by the Kantonale Ethikkommission Zürich (KEZ).

Participation in all study components was voluntary. HCPs and postpartum women provided informed consent before participating in any research activities. Data protection measures complied with Swiss data protection laws, with all data anonymized for analysis and reporting. No personally identifiable information was retained beyond what was necessary for study coordination.

5. IMPLEMENTATION AND ACTIVITIES

5.1 Phase II Activities (June 2023 - May 2024)

Launch of Phase II was originally scheduled for June 2023, however administrative issues with project approval delayed full launch until August 2023.

5.1.1 Healthcare Provider Qualitative Needs Assessment

Planning, Preparation and Ethics Approval (August 2023 – March 2024)

The project team recruited a medical student, Lisa Fontana, to work with them on the HCP Needs Assessment in August 2023. Together with Ms. Fontana, we began working on the Interview Guide and Ethics Application for the project at that time. After passing in-house review at SwissTPH, the completed interview guide, informed consent materials and ethics application were submitted to the EKNZ in February 2024 and received exemption from full review in March 2024.

The research protocol was submitted to the Ethikkommission Nordwest- und Zentralschweiz (EKNZ) for ethical review. Ethical approval (BASEC 2024-00371) was obtained before commencing data collection.

Recruitment and Data Collection (April – December 2024)

The recruitment process proved considerably more challenging than anticipated. Of 68 HCPs contacted through various channels, only eight agreed to participate in interviews—a response rate of approximately 12%. Sixty providers either declined participation or did not respond to recruitment attempts.

This low response rate necessitated extended and persistent recruitment efforts throughout 2024. The final sample included five midwives and three gynecologists, working in urban and rural settings, in hospitals and private practices.

Interviews were conducted in person, online via Zoom, or by telephone according to participant preference and scheduling availability. Interview duration ranged from 11 to 37 minutes. All interviews were audio-recorded with participant consent, transcribed verbatim immediately following completion, and anonymized to protect participant confidentiality. Transcripts included notation of participant type of education (midwife or gynecologist), work setting (hospital or practice), and workplace location (urban or rural) for analytical purposes.

Data Analysis (October 2024 – February 2025)

Data analysis proceeded concurrently with later interviews using an iterative approach. The qualitative data analysis software MAXQDA 24 supported the analysis process. Analysis employed combined inductive and deductive thematic analysis. After

familiarization with the data through repeated reading of transcripts, an initial coding framework was derived from the interview guide and relevant literature on vaccine communication, HCP behavior change (particularly the Theoretical Domains Framework), and prenatal care models.

The coding framework was iteratively refined through immersion in the data, with codes added, modified, or consolidated as new themes emerged. Review and definition of themes was followed by a second round of systematic coding with the finalized framework applied to all transcripts. Quotes illustrating key themes were selected and translated from German to English using DeepL translation software for inclusion in the final monograph.

Milestone: Master's Thesis Completion (November 2025)

The medical student completed her Master's monograph "Understanding Communication and Practices Related to Maternal Vaccination – Qualitative Assessment of Swiss Prenatal Health Care Providers Vaccine Discussion and Related Needs" in November 2025. The monograph provided comprehensive documentation of the qualitative research methodology, findings organized by major themes (HCP perspectives on roles, vaccine and communication training, communication approaches and techniques, and self-reported needs), discussion of implications using the Theoretical Domains Framework, and recommendations for tool development and training.

5.1.2 Postpartum Women's Survey through SWIFS 2024 Collaboration

Collaboration Establishment (September – November 2023)

In September 2023, the project team learned that a new round of the Swiss Infant Feeding Study (SWIFS) was approved for 2024. This national monitoring survey of postpartum women represented an excellent opportunity to collect representative data on maternal vaccine awareness and uptake, so the project team investigated whether collaboration was possible, receiving permission to submit questions for consideration in November 2023.

Agreement was reached to add a focused set of questions on maternal vaccination advice, vaccine uptake (influenza and pertussis), and reasons for vaccination decisions to the SWIFS 2024 survey instrument.

Question Development and Survey Preparation (December 2023 – April 2024)

The project team developed specific questions addressing whether mothers received vaccination advice during pregnancy, whether they received influenza and pertussis (Tdap) vaccines during their most recent pregnancy, and their reasons for receiving or not receiving these vaccines. Questions were designed with multiple response options to capture diverse motivations and barriers.

The vaccination questions were integrated into the broader SWIFS 2024 questionnaire.

The questionnaire was pilot tested in May 2024.

Sample Selection (June – August 2024)

The Swiss Federal Statistical Office (FSO) drew a random sample of 4,040 mothers from the population registry sampling frame. The sample was stratified by infant age groups (0-3 months, 4-6 months, 7-9 months, and 10-12 months) and language region (German-speaking, French-speaking, and Italian-speaking regions). Sample size calculation was based on breastfeeding prevalences from SWIFS 2014 to ensure adequate statistical power for the study's primary objectives.

Data Collection (September – December 2024)

The SWIFS research team mailed initial invitation letters to 4,040 mothers on September 9, 2024. Twenty addresses were excluded prior to mailing as they were single parent households with only the father's name and address, inconsistent with the study's focus on maternal experiences. A total of 1,363 mothers completed the questionnaire, representing a 34.2% response rate based on 3,990 letters with correct addresses. Response rates were relatively consistent across language regions: 34.7% in German-speaking, 35.9% in French-speaking, and 33.8% in Italian-speaking Switzerland.

Data Management and Cleaning (December 2024 – January 2025)

Once data collection ended on December 5, 2024, the complete dataset (N=1,363) was exported from REDCap into STATA-15 statistical software.

Data Analysis (January – March 2025)

After data cleaning, the SWIFS team shared study data with us and we carried out analysis on the questions related to maternal vaccination for inclusion in the final study report and to inform our larger project. Statistical significance testing employed Pearson's Chi-squared test and Fisher's exact test where appropriate. All vaccination-related analyses were conducted on the full eligible sample of 1,269 mothers, though some specific analyses excluded records with missing data on relevant variables (e.g., infant birthdate or gestational age for seasonal analyses).

Milestone: SWIFS Final Report Completion (November 2025)

The SWIFS research team completed the final report "SWIFS - Swiss Infant Feeding Study 2024: National monitoring on infant feeding in the first year of life" in November 2025. The comprehensive 128-page report included methodology, response rates, sample characteristics, and detailed results across all topic areas including the maternal vaccination section (Section 4.2.4). The report was delivered to the Federal Food Safety and Veterinary Office as the mandating agency.

5.1.3 Tool Development

Review of Existing Tools (August – October 2023)

Due to delays with initial data collection for the HCP needs assessment and the RAS, we added a third task to the first phase of our project: assessment of existing tools adapted to our project goals. This review identified tiered communication as a promising technique for adaptation to the Swiss context.

Outreach to MI4MI Team (November 2023 – December 2023)

We identified a research team at the University of Colorado that developed a tiered communication training targeting prenatal HCPs. We contacted this team, led by Prof. Dr. Sean T. O'Leary in November 2023. The team agreed to collaborate with us and shared their training materials with us.

Review of the 3-hour online asynchronous training confirmed that it was a good candidate for adaptation. Based on this determination, we adjusted the interview guide for the HCP Needs Assessment to specifically examine the appropriateness of the approach taught with this tool.

Assessing Tool Appropriateness (June 2024; October 2024 – March 2025)

We assessed tool appropriateness and adaptation needs based on three major sources of information. The first was based on feedback received during the National Vaccination Strategy Workshops in June 2024. We presented the tiered communication approach during two workshops at that meeting and received feedback from workshop participants (18) on the approach.

We further assessed tool appropriateness based on analysis of interviews carried out as part of the HCP Needs Assessment, carrying out multiple team meetings over the course of data collection and analysis to review preliminary findings. Finally, results from the SWIFS survey allowed us to assess the appropriateness of a tool targeting provider-patient communication.

5.2 Phase III Activities (April 2025 - November 2025)

Tool Adaptation (April 2025 – August 2025)

Based on the assessment of tool appropriateness, we adapted the training for use in Switzerland from April 2025 to August 2025. This adaptation required changes in the training regarding presumptive approaches to initiating vaccine discussions to ensure that suggested dialogues were culturally appropriate and to more clearly present the benefits and appropriateness of this communication approach in the context of vaccine counseling.

Adaptation involved developing and adjusting a script for each of the three training modules, translating the script into German, and creating presentations and exercises in German and incorporating adjustments in the training.

Tool finalization (August 2025-October 2025)

After training adaptations were complete, we developed a new 3-part asynchronous training in German, including an introductory video Module, hosted on YouTube, and two interactive asynchronous online trainings, hosted on Genially.

Tool launch for pilot testing (October 2025-November 2025)

The completed German training was distributed to gynecologists working in the German-speaking part of Switzerland through distribution of an invitation to test the training provide feedback via professional networks. Providers were invited to test the training and join a feedback session on November 27, 2025. Unfortunately, no providers were able to attend the feedback session.

Milestones: Completed German Training and Distributed Training (October 2025)

The completed training is available on YouTube and Genially using the links provided in the Training Distribution Flyer. It was distributed to gynecologists working the German-speaking part of Switzerland through an invitation to test the training distributed through professional networks.

5.3 Timeline Summary and Major Milestones

Key Project Milestones Summary:

Milestone	Date	Description
Phase II Launch	August 2023	Project activities commenced following administrative approval
Ethics Approval	March 2024	EKNZ approval obtained (BASEC 2024-00371)
SWIFS Pilot Testing	May 2024	Questionnaire pilot tested with 31 mothers
NSI Workshop Feedback	June 2024	Tiered communication approach presented; feedback from 18 participants
SWIFS Data Collection Launch	September 2024	Invitation letters mailed to 4,040 mothers
SWIFS Data Collection Complete	December 2024	1,363 completed surveys (34.2% response rate)

HCP Analysis Complete	February 2025	Qualitative thematic analysis finalized
SWIFS Analysis Complete	March 2025	Maternal vaccination data analysis finalized
German Training Complete	October 2025	3-part training finalized and hosted online
German Training Distributed	October 2025	Distributed via email to professional networks
Master's Monograph Complete	November 2025	Comprehensive HCP needs assessment documented
SWIFS Final Report Complete	November 2025	National monitoring report delivered to FSVO
Final Project Report	November 2025	Comprehensive project documentation submitted to BAG

5.4 Information Security Measures

Throughout the project implementation period, the project team maintained strict compliance with information security standards to protect sensitive research data, participant confidentiality, and project documentation in accordance with Swiss data protection requirements and international best practices. Information security measures applied to data collected during the HCP Needs Assessment and the SWIFS Survey.

5.4.1 Ethical Approval and Data Protection Framework

Research activities for the HCP Needs Assessment were conducted under ethical approval from the Ethikkommission Nordwest- und Zentralschweiz (EKNZ, approval number BASEC 2024-00371). The ethical review process included comprehensive assessment of data protection measures, informed consent procedures, and participant confidentiality safeguards. All participants provided written informed consent prior to interview participation. Consent forms explicitly detailed data collection methods, storage procedures, confidentiality protections, and intended uses of research findings.

Interview audio recordings were stored on password-protected devices with access restricted to authorized research team members. Transcripts were anonymized immediately upon completion, with all identifying information (names, specific workplace details, patient examples containing identifiable information) removed or pseudonymized. Anonymized transcripts retained only relevant professional

characteristics (profession type, work setting, workplace location category) necessary for analysis.

SWIFS 2024 Survey

The SWIFS 2024 study employed rigorous data protection measures consistent with Swiss Human Research Act requirements and the Swiss Federal Act on Data Protection (FADP). Although the study was exempted from full ethical review by the Swiss Ethics Committee of the canton of Zürich, data protection protocols were implemented throughout.

Survey data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools version 15.4.3, hosted at Zurich University of Applied Sciences. REDCap is a secure web-based software platform designed for research data management, providing: audit trails for tracking data manipulation and export; user-based access privileges and authentication; automated data validation and range checks; and encrypted data transmission and storage.

Participation consent was obtained on the first page of the online questionnaire after presenting comprehensive information on scope, aims, and data protection measures. Survey data were analyzed anonymously, with no personal identifying information (names, specific addresses) linked to survey responses. The FSO provided only the minimum contact information necessary for survey invitation (name, mailing address), with this information used solely for survey administration and not linked to response data.

5.4.2 Data Storage and Access Control

Secure Storage Infrastructure

All project data were stored on secure servers maintained by Swiss Tropical and Public Health Institute (Swiss TPH), with regular automated backups to prevent data loss. Access to servers was restricted through institutional authentication systems requiring unique user credentials and multi-factor authentication where available.

Access Control Procedures

Access to sensitive research data was restricted on a need-to-know basis:

- HCP interview recordings and transcripts: Access limited to the medical Master's student conducting interviews, primary project supervisor (Dr. Kristen Jafflin), and co-supervisor (Dr. Sonja Merten);
- SWIFS survey data: Access to the complete dataset managed by SWIFS research team at ZHAW and Swiss TPH;

- Project documentation: Shared among core project team members through secure institutional file sharing systems with encryption in transit and at rest

5.4.3 Data Sharing and Transfer Protocols

Data sharing between collaborating institutions (Swiss TPH and ZHAW for SWIFS collaboration) followed secure transfer protocols:

- Large datasets transferred via secure file transfer protocols or institutional secure sharing platforms rather than email;
- Shared data limited to minimum necessary for collaborative purposes;
- No personal identifying information shared between institutions.

5.4.4 Data Retention and Disposal

Data retention periods comply with Swiss research data management requirements and funder policies:

- Raw research data (interview recordings, anonymized transcripts, survey datasets): Retained for minimum 10 years following project completion to enable verification of findings and potential secondary analysis
- Personal identifying information (participant contact details, consent forms): Retained separately from research data for required retention period, then securely destroyed
- Project administrative documents: Retained according to institutional and funder record-keeping requirements

Secure disposal procedures for data no longer requiring retention include permanent deletion of electronic files with overwriting to prevent recovery; shredding of physical documents containing sensitive information; and documented data disposal procedures maintained in project records.

These measures ensured that throughout project implementation, participant data, research findings, and project documentation were protected according to current information security best practices appropriate for health research contexts.

6. RESULTS AND FINDINGS

6.1 Healthcare Provider Needs Assessment Findings

The HCP needs assessment explored how prenatal HCPs approach vaccine counseling, what training they have received, and what support they need to effectively communicate about maternal vaccination. Analysis of interview data using the Theoretical Domains Framework revealed important insights into capability factors (knowledge and skills), opportunity factors (structural and organizational context), and motivation factors (professional identity and role perceptions) that shape vaccine communication in Swiss prenatal care. The findings highlighted both shared challenges across professional groups and distinct differences in how midwives and gynecologists conceptualize their roles and communicate about vaccination during pregnancy.

Key Findings on Provider Roles and Care Models

The analysis revealed three main models of prenatal care collaboration affecting vaccine counseling:

1. gynecologists working independently or in hospitals alongside midwives,
2. midwives employed in hospitals or joint practices with gynecologists, and
3. self-employed midwives working independently.

In joint care settings, vaccine counseling emerged as a shared but sometimes ambiguous responsibility, with both professional groups addressing vaccination but with different levels of involvement.

A critical structural barrier identified was that midwives cannot prescribe vaccines in Switzerland. In independent midwife-led care, this separation of counseling and prescription created challenges for same-day vaccination, potentially reducing uptake. Unlike hospital or group practice settings where gynecologists and midwives collaborate closely, independent midwives reported that patients must schedule separate appointments to obtain prescriptions, fragmenting the care process.

Professional identity significantly influenced vaccination communication approaches. Midwives consistently emphasized patient autonomy and informed choice as core professional values, often framing their role as providing comprehensive information while remaining neutral about personal recommendations. Several midwives reported that during their training, they were explicitly taught that recommending vaccines was the responsibility of physicians rather than midwives. In contrast, gynecologists more frequently positioned themselves as active recommenders of vaccination from a public health perspective, viewing vaccine promotion as integral to their medical responsibility for maternal and fetal health.

Training Gaps Identified

Both midwives and gynecologists reported receiving some instruction on vaccination during basic training, focused primarily on scientific aspects: which vaccines are recommended during pregnancy, disease risks, contraindications, and side effects. However, several midwives described vaccination as only a marginal topic in their education, with some reporting they were taught that vaccine counseling was "not the responsibility of midwives." Multiple participants reported engaging in self-directed learning to acquire knowledge needed for their work, indicating gaps between training content and practice requirements.

All participants reported receiving general communication training that included theory and practical role-play scenarios, with midwives emphasizing that communication skills were central to their professional education. However, none reported receiving training specifically on vaccine communication or strategies for addressing vaccine hesitancy. When asked about Motivational Interviewing (MI), some participants reported familiarity with the concept, but its application was described primarily in relation to lifestyle changes (nutrition, smoking cessation) rather than vaccination. No gynecologists reported receiving MI training in their initial education, though one had encountered it in subsequent psychosomatic medicine training.

Reflecting on their vaccine communication competence, gynecologists generally emphasized systemic challenges (language barriers, time constraints, patient attitudes) as obstacles, while midwives more frequently reported personal uncertainties regarding their knowledge or communication abilities. Notably, no midwives reported feeling confident addressing vaccine hesitancy, whereas all gynecologists described themselves as confident in this domain.

Communication Approaches Observed

HCPs typically initiated vaccine discussions rather than waiting for patients to raise the topic, aiming to do so early in pregnancy to allow time for informed decision-making. Vaccine counseling commonly began with an open-ended question about the patient's existing knowledge or a general statement that vaccines are recommended during pregnancy, followed by detailed explanations of pertussis and influenza diseases and associated risks. Side effects were mentioned only marginally and described as minimal.

Analysis revealed a communication pattern distinct from approaches documented in pediatric settings. Rather than using a strictly presumptive approach ("You're due for your pertussis vaccine today") or purely participatory approach ("How do you feel about vaccines?"), many HCPs employed what the research termed "data dumping" – providing detailed, general information about disease risks with persuasive elements aimed at convincing patients to opt in to vaccination. This approach differed from presumptive communication where vaccination is presented as routine care from which patients can opt out.

Clear differences emerged between professional groups. Midwives typically presented official recommendations while refraining from personal opinions, emphasizing family autonomy in decision-making. When addressing hesitancy, midwives used patient-centered techniques resembling MI elements: open-ended questions, reflective listening, and affirmations to validate concerns. Gynecologists more directly stated personal recommendations for vaccination and, when addressing hesitancy, typically provided additional information following an "information deficit model" approach.

Provider-Identified Needs

Participants identified four main categories of needs:

1. Supporting materials: easily accessible information for pregnant women in clear language and multiple languages, potentially including short explanatory videos;
2. Further education: structured training on vaccination and vaccine hesitancy communication, with several reporting their initial training did not adequately prepare them for this responsibility;
3. Broader public engagement: society-wide vaccination information campaigns so HCPs don't "start vaccine discussions at zero"; and
4. Systemic adjustments: particularly addressing time constraints that prevent in-depth counseling.

6.2 SWIFS Survey Findings related to Maternal Vaccination

The maternal vaccination assessment, conducted through collaboration with the Swiss Infant Feeding Study (SWIFS) 2024, gathered data from 1,269 postpartum women with infants aged 3-14 months across all Swiss language regions. The survey assessed whether mothers received vaccination advice during pregnancy, their uptake of recommended maternal vaccines (influenza and pertussis), and their reasons for accepting or declining vaccination. These data provided complementary insights to the HCP assessment, revealing the patient perspective on maternal vaccination communication and identifying specific barriers and motivators influencing vaccination decisions.

Vaccination Advice and Counseling Coverage

The majority of mothers (85%, N=1,082) reported receiving advice on vaccination during pregnancy, indicating that most HCPs addressed the topic during prenatal care. However, 13% (N=169) reported not receiving vaccination advice, and 1.4% (N=18) were unsure whether they had received such counseling. These findings reveal a coverage gap affecting approximately one in seven pregnant women, representing missed opportunities for vaccine counseling during the prenatal care period.

Vaccination Uptake Rates

Uptake of recommended maternal vaccines varied substantially by vaccine type. Pertussis (Tdap) vaccination showed relatively high coverage, with 70% (N=889) of mothers reporting they received the vaccine during pregnancy. In total, 27.5% (N=354) did not receive pertussis vaccination during pregnancy, and 2.0% (N=26) were unsure of their vaccination status.

In contrast, influenza vaccination uptake was considerably lower. Only 22% (N=274) of mothers reported receiving influenza vaccination during pregnancy, with an additional 5.8% (N=74) reporting pre-pregnancy vaccination. The majority, 68% (N=865), did not receive influenza vaccination during pregnancy, and 4.4% (N=56) were unsure of their vaccination status.

At 23%, uptake was higher among women who were pregnant during the influenza vaccination season (conservatively defined as October 15 through December 31), compared to women who were not pregnant during this season (11%, p=0.007). This finding confirms that HCPs are more likely to offer influenza vaccination when pregnancy overlaps with the seasonal vaccination period. However, even among women pregnant during the optimal vaccination window, uptake remained substantially below public health targets, with more than three-quarters not receiving the vaccine.

Motivations for Accepting Vaccination

Among mothers who received either pertussis or influenza vaccines, HCP recommendation emerged as the predominant motivating factor. For pertussis vaccination, 91% (N=811 of 889) cited HCP recommendation as a reason for vaccination, underscoring the critical role of provider communication. For influenza vaccination, 82% (N=224 of 274) cited provider recommendation as a motivating factor.

Protecting the infant was also a major motivation, cited by 77% (N=682) of women who received pertussis vaccination and 74% (N=202) of women who received influenza vaccination. This finding indicates that maternal concern for infant health represents a powerful motivator that HCPs can leverage in vaccine counseling.

Protecting their own health was more commonly cited as a motivation for influenza vaccination (58%, N=159) compared to pertussis vaccination (27%, N=242), which is appropriate.

Barriers to Vaccination

Among mothers who did not receive pertussis vaccination during pregnancy (N=233), the most commonly cited barrier was belief that vaccination was "not necessary" (55%, N=127). This finding suggests that many women who decline pertussis vaccination do so not because of active opposition or safety concerns, but because they do not perceive a sufficient need for the vaccine, potentially reflecting inadequate understanding of pertussis risks or the protective benefits of maternal vaccination.

Lack of HCP recommendation was cited by 32% (N=75) of women who did not receive pertussis vaccination, representing clear missed counseling opportunities. Safety concerns represented important but less prevalent barriers. Eighteen percent (N=42) expressed concerns about vaccine safety and effectiveness generally, and 25% (N=58) specifically cited concerns about safety for the infant. These findings indicate that while safety concerns affect a substantial minority of women, perceived lack of necessity is a more common barrier.

Among mothers who did not receive influenza vaccination during pregnancy and who were pregnant during the influenza vaccination season (N=700), similar patterns emerged. Sixty-four percent (N=446) cited belief that vaccination was "not necessary" as a reason for non-vaccination, suggesting even lower perceived need for influenza vaccination compared to pertussis. Lack of HCP recommendation was cited by 43% (N=299), indicating that influenza vaccination may be discussed or recommended less consistently than pertussis vaccination during prenatal care.

Only small proportions cited "other" reasons for non-vaccination (11% for pertussis, 8.1% for influenza), with open-ended responses mentioning factors such as timing (finding out about the recommendation too late in pregnancy), access issues, or previous adverse reactions to vaccines.

6.3 Tool Adaptation

Given the evidence of its efficacy and the existence of tiered communication trainings specifically for vaccination during pregnancy, we identified these trainings as excellent candidates for adaptation for use in Switzerland in the context of this project, and we contacted the research team that developed the training specifically for maternal vaccination, led by Prof. Dr. Sean T. O'Leary at the University of Colorado. The team agreed to collaborate with us and shared their training materials.

We were given an opportunity to present this technique during the Swiss National Vaccination Strategy Workshop in June 2024. During the two Working Group sessions, we gathered feedback from participants on the feasibility and acceptability of the tiered communication approach in Switzerland.

Feedback from the working group sessions, as well as the HCP Needs Assessment analysis and the analysis of SWIFs survey results confirmed that tiered communication is a promising technique for improving provider-patient vaccine communication in Switzerland. However, the analysis also pointed to the need to carefully adapt training regarding presumptive approaches to initiating vaccine conversations, as interviews with HCPs found little evidence that such approaches are commonly used by prenatal HCPs, and workshop feedback highlighted that overly directive presumptive approaches could be culturally inappropriate.

6.4 Key Insights and Synthesis of Findings

Findings from the various investigations in Phase II supported the decision to focus on improving provider-patient communication through training in tiered communication but also highlighted ways this approach needed to be adapted for use in Switzerland.

Convergence on the Primacy of Provider Recommendation

The studies confirmed the central importance of HCP recommendation in maternal vaccination decisions. Providers recognized their influential role in vaccine discussions, and maternal survey data powerfully confirmed this perception: 82-91% of vaccinated mothers cited provider recommendation as a key reason for vaccine acceptance. This finding highlights the importance of enhancing provider communication skills as the primary intervention strategy and underscores that improvements in how providers communicate about vaccination could substantially impact uptake rates.

The "Necessity Gap" as the Primary Barrier

While the HCP assessment revealed concerns about addressing vaccine hesitancy and safety questions, the maternal survey data showed that active safety concerns were not the predominant barrier to vaccination. Instead, 55-64% of non-vaccinated mothers cited belief that vaccination was "not necessary" as their reason for declining vaccines—more than double the proportion citing safety concerns (7-25% depending on vaccine).

This finding has critical implications. It suggests that many pregnant women are not actively opposed to maternal vaccination but rather unconvinced of its relevance or importance. This "necessity gap" is potentially more amenable to communication interventions than deeply held safety concerns or vaccine resistance. However, addressing this gap requires providers to clearly articulate disease risks and the protective benefits of maternal vaccination—moving beyond general information provision to make a compelling case for vaccination's importance.

The provider assessment revealed that current communication often involves detailed explanations of disease mechanisms and vaccine science ("data dumping") but may not effectively convey the urgency or personal relevance of vaccination. The disconnect between provider communication patterns and the primary patient barrier (perceived lack of necessity) highlighted the need for training that helps providers deliver clear recommendations and concise, compelling messages about why vaccination matters.

Professional Identity and Communication Style Differences

The provider assessment revealed substantial differences in how midwives and gynecologists conceptualize their roles in vaccine counseling. Midwives emphasized autonomy and informed choice, often avoiding personal recommendations, while gynecologists positioned themselves as active vaccine advocates from a public health

perspective. Several midwives reported being taught that vaccine recommendation was "not their responsibility."

The common perspective among midwives, emphasizing maximizing patient autonomy and avoiding direct recommendations, is incompatible with the tiered communication approach's emphasis on beginning vaccine discussions with a presumptive statement assuming patients will vaccinate like, "You're scheduled to receive two vaccines today." For this reason, we chose to focus on medical doctors for the initial training testing. More fundamental changes in training and identity may be necessary for midwives so that they see promoting recommended maternal vaccinations as key part of high-quality prenatal care that is in-keeping with their role and compatible with supporting patient autonomy.

The Unexpected "Data Dumping" Communication Pattern

The identification of "data dumping" as a prevalent communication approach in Swiss prenatal care represented an unexpected finding not previously documented in vaccine communication literature. This approach, providing detailed, general disease and vaccine information with persuasive elements aimed at convincing patients to opt in, differs from both the presumptive approaches recommended by the tiered communication method.

Implications for Tool Adaptation

These insights directly informed several key adaptation decisions for Phase III. Most importantly, we adapted the portion of the training focusing on using a presumptive starting point that normalizes vaccination as routine prenatal care, directly addressing the "necessity gap" by framing vaccines as expected. However, provider interviews and workshop feedback indicated that overly directive presumptive approaches could be culturally inappropriate in the Swiss context, where patient autonomy is highly valued. This necessitated careful adaptation of training language to present presumptive communication as clear, confident recommendation rather than paternalistic directive.

The assessment also revealed that midwives face barriers that tiered communication training alone cannot address. First, substantial knowledge gaps exist: midwives described vaccination as marginal in their education, reported relying on self-directed learning, and expressed uncertainty about addressing patient questions. This knowledge deficit requires foundational education on vaccine science and safety before communication skills training can be effective.

Second, and more fundamentally, midwives' professional identity as patient autonomy advocates creates conflict with presumptive approaches. The tiered method begins with statements normalizing vaccination as routine (e.g., "You're scheduled for your pertussis vaccine today"), which directly contradicts the neutral, non-directive stance that midwives viewed as appropriate professional practice when discussing vaccines.

For these reasons, we focused the initial German-language training on medical doctors, recognizing that effective midwifery training would require additional foundational components addressing both knowledge gaps and professional role conceptualization.

7. ALIGNMENT WITH NATIONAL VACCINATION STRATEGY GOALS

The project maintained strong alignment with Switzerland's National Vaccination Strategy (NSI) throughout its implementation, contributing evidence and practical tools to advance the strategy's three core objectives. This section demonstrates how project activities and outputs directly supported NSI goals and generated insights relevant to ongoing implementation of the national strategy.

7.1 Contribution to NSI Objective 1: Stakeholder Commitment

The first NSI objective aims to encourage stakeholders, particularly HCPs, to recognize vaccinations as essential for population health and to provide consistent, unified information to the public. The project directly advanced this goal through multiple mechanisms.

Strengthening Provider Capacity and Confidence

The HCP needs assessment identified critical gaps in prenatal HCPs' preparation for vaccine counseling. By developing and disseminating an evidence-based communication training tool specifically tailored to prenatal care providers, the project directly addressed these capability gaps, equipping providers with concrete techniques to confidently recommend maternal vaccination. The tiered communication training provides prenatal care providers with an effective and efficient approach to vaccine discussions that can be used with all patients.

Addressing Professional Role Clarity

A significant finding from the provider assessment was role ambiguity, particularly among midwives, regarding responsibility for vaccine counseling. Several midwives reported being taught that vaccine recommendation was "not their responsibility," contributing to inconsistent counseling coverage or believing that making clear vaccination recommendations was incompatible with their mission to support patient autonomy. The project's findings highlighted the need for clearer professional guidance establishing that evidence-based vaccine recommendation is within the scope of practice for all prenatal care providers—gynecologists, midwives, and general practitioners—and represents a core component of quality prenatal care.

7.2 Contribution to NSI Objective 2: Public Trust

The second NSI objective focuses on ensuring the public can make informed vaccination decisions based on adequate understanding and trust in official recommendations. The project contributed to this goal by generating evidence on maternal vaccination decision-

making processes and developing tools to improve the quality of vaccination information pregnant women receive from their HCPs.

Understanding the "Necessity Gap"

The SWIFS maternal vaccination data revealed that the primary barrier to vaccination was not active opposition or distrust, but rather belief that vaccination was "not necessary" (cited by 55-64% of non-vaccinated mothers depending on vaccine type). This finding indicates that many pregnant women are receptive to vaccination but unconvinced of its personal relevance or urgency. Safety concerns, while important for a substantial minority (7-25%), were secondary to this necessity gap.

This evidence has critical implications for communication strategies aligned with NSI goals. Rather than focusing primarily on countering misinformation or addressing safety concerns, effective communication must clearly articulate disease risks during pregnancy, explain the protective benefits of maternal vaccination for both mother and infant, and frame vaccination as an expected component of prenatal care. The tiered communication training addresses this necessity gap by teaching providers to use presumptive approaches that normalize vaccination while remaining responsive to individual concerns.

Supporting Informed Decision-Making Through Quality Communication

The project's identification of "data dumping" as the prevalent communication approach in Swiss prenatal care revealed a gap between current practices and effective informed decision-making support. While providers were providing detailed scientific information about vaccines, this approach may fail to effectively convey the provider’s specific recommendation or enable genuine informed choice.

The tiered communication approach addresses this limitation by teaching providers to begin with clear, presumptive recommendations that establish vaccination as routine care, then employ motivational interviewing techniques when patients express hesitancy. This approach respects patient autonomy while providing the clear guidance that research demonstrates is most effective in supporting vaccine acceptance.

7.3 Contribution to NSI Objective 3: Access to Information

The third NSI objective emphasizes access to information. The project contributed to this goal by developing tools designed for efficient integration into routine clinical workflows and by identifying structural barriers to vaccination access.

Integrating Vaccination into Routine Prenatal Care

The project strategically focused on the prenatal care setting as an optimal environment for maternal vaccination promotion. Pregnant women already have regular, scheduled healthcare contact throughout pregnancy, creating natural opportunities for vaccination

counseling and administration without requiring additional appointments. The tiered communication training is designed to fit within typical prenatal consultation timeframes, addressing the time constraints that providers identified as a major barrier to comprehensive vaccine counseling.

By framing maternal vaccination as a routine component of prenatal care, parallel to other preventive measures like folic acid supplementation, screening tests, and nutritional counseling, the presumptive communication approach taught in the training normalizes vaccination and simplifies the decision-making process for pregnant women. Rather than presenting vaccination as an optional intervention requiring extensive deliberation, presumptive communication positions it as standard care that most women will accept unless they have specific concerns requiring discussion.

Identifying and Addressing Structural Barriers

The provider needs assessment identified critical structural barriers affecting vaccination access, particularly in midwife-led care models. Midwives cannot prescribe vaccines in Switzerland; they can only administer vaccines prescribed by physicians. In independent midwifery practices, this separation of counseling and prescription creates logistical challenges requiring patients to schedule separate physician appointments solely to obtain vaccine prescriptions, fragmenting care and potentially reducing uptake.

While resolving this structural barrier requires policy changes beyond the project's scope, documenting this barrier provides important evidence for policy discussions.

8. CHALLENGES AND ADAPTATIONS

The project implementation involved several methodological and scope adaptations from the original 2023 proposal. These adaptations were made to strengthen scientific rigor, leverage collaborative opportunities, and in response to implementations challenges. This section briefly documents the major adaptations and their rationale.

8.1 Phase II Methodological Adaptations

Evaluation of needs and attitudes of pregnant women: SWIFS collaboration rather than dedicated RAS

The original proposal planned to conduct a Rapid Assessment Survey (RAS) specifically designed for this project, administered to pregnant women at participating maternity centers. When the opportunity arose in September 2023 to collaborate with the Swiss Infant Feeding Study (SWIFS) 2024, a national monitoring study with rigorous population-based sampling, the team made a pragmatic decision to integrate maternal vaccination questions into this established survey rather than implementing a separate RAS.

This collaboration provided several advantages: access to a nationally representative sample (1,269 mothers) substantially larger than the RAS would likely have achieved; integration with a well-established monitoring framework with proven methodology and high response quality; and cost-effectiveness through resource sharing.

The SWIFS collaboration imposed certain constraints compared to the originally planned RAS. The survey instrument was limited to a focused set of questions on vaccination advice, vaccine uptake, and reasons for vaccination decisions, and did not include an assessment of vaccine hesitancy. The sample consisted of postpartum women rather than currently pregnant women, requiring retrospective recall.

Despite these limitations, the collaboration provided robust data on maternal vaccination experiences, uptake rates, motivations, and barriers across a large, representative sample that directly informed tool adaptation decisions in Phase III.

8.2 Phase III Scope Adaptations

Focus on Physicians Rather Than All Provider Types

The Phase II HCP assessment revealed that midwives face two fundamental barriers that the tiered communication training alone cannot adequately address. First, midwives reported substantial knowledge gaps regarding vaccination during pregnancy, with several describing vaccination as only a marginal topic in their education and reporting reliance on self-directed learning. Multiple midwives expressed uncertainty about their ability to answer patient questions or address concerns, with none reporting confidence in managing vaccine hesitancy.

Second, midwives' professional identity as patient autonomy advocates creates inherent tension with presumptive communication approaches. The tiered communication method begins with presumptive statements that normalize vaccination as routine care (e.g., "You're scheduled for your pertussis vaccine today"), which directly conflicts with the neutral, non-directive stance that many midwives were viewed as appropriate professional practice when discussing vaccines.

Based on these findings, the team decided to focus the initial German-language training on medical doctors (gynecologists and general practitioners) rather than attempting to serve both physician and midwife audiences with a single training tool. This decision recognized that effective midwifery training would require additional foundational components addressing both knowledge gaps and professional role conceptualization before communication technique training could be productive, a more extensive intervention beyond the scope and resources of this project.

Incomplete Phase III Impact Evaluation

The original Phase III objectives included comprehensive impact assessment examining vaccine confidence (primary endpoint), patient satisfaction, actual vaccine uptake, and HCP confidence and satisfaction through both qualitative provider interviews and quantitative patient surveys. Due to timeline constraints resulting from extended Phase II data collection and analysis, this comprehensive evaluation was not completed within the project period.

Rather than attempting incomplete or methodologically compromised impact evaluation, Phase III efforts focused on high-quality tool adaptation ensuring cultural appropriateness and pedagogical effectiveness, professional development of training materials in accessible online formats, and dissemination to target audience for initial pilot use. The training should be considered a pilot product requiring future evaluation rather than a proven intervention with documented effectiveness in the Swiss context.

8.3 Timeline Adjustments

The project experienced timeline extensions beyond the original Phase II completion target of March 2024. First, project launch was delayed until August 2023 due to delays in final project approval. Second, data collection for the HCP need’s assessment extended through December 2024 due to recruitment challenges (achieving a response rate of approximately 12% from 68 providers contacted required persistent recruitment efforts throughout the year). Data analysis continued through February 2025, and the comprehensive Phase II synthesis was completed in March 2025.

These extensions compressed the Phase III timeline, with tool adaptation occurring April-August 2025 and finalization August-October 2025. The training was distributed to gynecologists in October 2025. A feedback session was scheduled for November 27,

2025; however, no providers were able to attend, and time constraints prevented scheduling alternative feedback opportunities before the project conclusion in November 2025.

As a result, the training tool represents the project team's evidence-based adaptation of the original MI4MI training for Swiss context, informed by Phase II findings and National Vaccination Strategy workshop feedback, but without direct user testing and iteration with the target audience following completion. Future implementation should include systematic collection of user feedback and iteration of training content based on that feedback.

9. OUTPUTS AND DELIVERABLES

The project generated multiple research outputs, a practical training tool, and dissemination activities during the implementation period (August 2023 - November 2025). This section documents the concrete deliverables produced through project activities.

9.1 Research Outputs

Master's Monograph: Understanding Communication and Practices Related to Maternal Vaccination

The medical Master's student, Lisa Fontana, completed her monograph "Understanding Communication and Practices Related to Maternal Vaccination – Qualitative Assessment of Swiss Prenatal Health Care Providers Vaccine Discussion and Related Needs" in November 2025. The monograph serves as the primary documentation of the Phase II HCP needs assessment and provides the detailed evidence base that informed Phase III tool adaptation decisions.

SWIFS 2024 Final Report

The Swiss Infant Feeding Study (SWIFS) research team completed the final report "SWIFS - Swiss Infant Feeding Study 2024: National monitoring on infant feeding in the first year of life" in November 2025. This 128-page comprehensive national monitoring report was delivered to the Federal Food Safety and Veterinary Office as the primary mandating agency.

The research teams carried out the analysis in section 4.2.4 "Vaccination in Pregnancy", examining the questions we contributed to the survey. The SWIFS 2024 report provides the first nationally representative estimates of uptake of vaccines recommended during pregnancy in Switzerland and serves as a reference for future monitoring of maternal vaccination trends.

Research Datasets

HCP Interview Dataset: Anonymized transcripts of 8 semi-structured interviews with prenatal HCPs (5 midwives, 3 gynecologists) conducted April-December 2024 in German-speaking Switzerland. Interviews ranged from 11-37 minutes and were transcribed verbatim. The dataset includes coded transcripts analyzed using MAXQDA 24 software with combined inductive and deductive thematic analysis. Data are stored securely at Swiss Tropical and Public Health Institute with restricted access and will be retained for 10 years following project completion in accordance with research data management requirements.

SWIFS 2024 Data: The project team received access to the SWIFS 2024 dataset (N=1,269 mothers). The complete SWIFS dataset is managed by the SWIFS research team at ZHAW

and Swiss TPH. Data are stored securely with appropriate access controls and retention procedures managed by the SWIFS team.

Survey Instruments Developed

HCP Interview Guide: Semi-structured interview guide exploring four key domains: (1) participants' education in vaccination and communication, (2) organization of maternal care and prenatal vaccination services, (3) approaches and techniques used to communicate about vaccines with pregnant patients, and (4) needs regarding vaccine communication. The guide was developed in German with English translation. The complete interview guide is included as an appendix to the Master's monograph.

SWIFS 2024 Maternal Vaccination Questions: A focused set of questions integrated into the SWIFS 2024 survey instrument addressing: whether mothers received vaccination advice during pregnancy; whether they received influenza and pertussis (Tdap) vaccines during pregnancy; and reasons for receiving or not receiving these vaccines (multiple response options capturing diverse motivations and barriers). Questions were developed in collaboration with the SWIFS research team and professionally translated to German, French, Italian, and English.

Manuscript in Preparation

A manuscript analyzing the SWIFS 2024 maternal vaccination data in greater depth is currently in preparation for submission to Swiss Medical Weekly. This manuscript will provide more detailed analysis of maternal vaccination uptake patterns, barriers, and motivations than was possible within the SWIFS final report, with specific focus on implications for public health interventions and clinical practice in Switzerland. The manuscript is targeted for submission in early 2026.

9.2 Training Tool and Materials

Tiered Communication Training for Maternal Vaccination (German)

The primary deliverable of Phase III was a completed 3-part asynchronous online training in German, adapted from the MI4MI (Motivational Interviewing for Maternal Immunization) training developed by Prof. Dr. Sean T. O'Leary and colleagues at the University of Colorado. The adapted training specifically targets gynecologists and general practitioners providing prenatal care in German-speaking Switzerland.

Training Structure:

Module 1: Introduction to Tiered Communication (YouTube Video)

- Overview of maternal vaccination recommendations in Switzerland
- Evidence on effectiveness of HCP recommendations
- Introduction to tiered communication approach

- Rationale for presumptive and motivational interviewing techniques
- Duration: Approximately 30 minutes
- Format: Video hosted on YouTube for accessible public access
- Language: German with on-screen text in German

Module 2: Mastering the skills needed for Tiered Communication (Genially Interactive Training)

- Detailed instruction on the key components of tiered communication, including:
    - Presumptive approaches to initiating vaccine discussions
    - How to determine when motivational interviewing is appropriate
    - Motivational interviewing techniques when addressing substantial concerns or hesitancy
- Practical exercises to assess understanding of the material
- Duration: Approximately 1 hour
- Format: Interactive asynchronous training hosted on Genially platform
- Language: German

Module 3: Tiered Communication in Practice (Genially Interactive Training)

- Review of the tiered communication approach
- Use scenarios with common hesitancy concerns
- Practical exercises identifying tiered communication techniques in practice
- Duration: Approximately 1 hour
- Format: Interactive asynchronous training hosted on Genially platform
- Language: German

Access Information:

The completed training is publicly accessible through links provided in the training distribution materials. The modular format allows providers to complete the training at their own pace and revisit specific modules as needed. No registration or fee is required for access, supporting broad dissemination to prenatal care providers.

Training Distribution Materials

A training distribution flyer was developed in German providing:

- Overview of training purpose and target audience
- Description of the three training modules with estimated time requirements
- Direct links to access each module (YouTube and Genially)
- Brief explanation of the evidence base for tiered communication
- Contact information for questions or feedback

This flyer was distributed electronically to gynecologists in German-speaking Switzerland through professional networks in October 2025.

9.3 Dissemination and Knowledge Transfer Activities

National Vaccination Strategy Workshop Presentations (June 2024)

The project team presented the tiered communication approach at two working group sessions during the Swiss National Vaccination Strategy Workshop held in Bern in June 2024. A total of 18 workshop participants attended these sessions.

The presentations covered:

- Overview of tiered communication approach for maternal vaccination
- Evidence base for presumptive and motivational interviewing techniques
- Discussion of feasibility and acceptability in Swiss context

Workshop participants provided valuable feedback on the appropriateness of the approach for use in Switzerland, particularly emphasizing the need to carefully adapt presumptive language to ensure cultural appropriateness. This feedback directly informed Phase III tool adaptation decisions, particularly regarding how presumptive communication was presented and taught in the training modules.

Training Distribution to Professional Networks (October 2025)

Following completion of the German-language training in October 2025, the training distribution flyer was disseminated electronically to gynecologists working in German-speaking Switzerland through professional networks and associations. The distribution targeted gynecologists in both hospital and private practice settings across urban and rural areas.

A feedback session was scheduled for November 27, 2025, inviting providers who had completed the training to share their experiences, suggestions for improvement, and practical implementation insights. Unfortunately, no providers were able to attend this scheduled session due to scheduling conflicts and time constraints.

Collaboration with SWIFS Research Team

The project established a productive collaborative relationship with the SWIFS 2024 research team at ZHAW (Zurich University of Applied Sciences) and Swiss TPH. This collaboration involved:

- Development of maternal vaccination questions for integration into SWIFS survey
- Collaborative analysis and interpretation of maternal vaccination findings
- Co-authorship on the SWIFS final report (Section 4.2.4)
- Ongoing collaboration on manuscript preparation for Swiss Medical Weekly

This collaboration model demonstrates effective integration of project-specific research questions into established national monitoring infrastructure, maximizing efficiency and data quality while building sustainable research partnerships.

Collaboration with University of Colorado MI4MI Team

The project established international collaboration with Prof. Dr. Sean T. O'Leary and the MI4MI development team at the University of Colorado. This collaboration involved:

- Sharing of original MI4MI training materials for adaptation
- Permission to adapt and translate training content

This collaboration enabled the project to build on proven, evidence-based training content rather than developing entirely new materials, improving quality and efficiency while contributing to international knowledge exchange on maternal vaccine communication.

9.4 Project Reports

This comprehensive final project report documents all project activities, findings, and deliverables for the contract period June 2023 - November 2025.

9.5 Summary of Deliverables

The project successfully produced:

- **2 major research reports** (Master's monograph, SWIFS 2024 final report)
- **2 research datasets** (HCP interviews, SWIFS maternal vaccination data)
- **1 complete training tool** (3-part German-language asynchronous training)
- **1 manuscript in preparation** for peer-reviewed publication
- **Multiple dissemination activities** (NSI workshop, professional network distribution)
- **2 collaborative partnerships** (SWIFS team, University of Colorado MI4MI team)

- **This final project report** documenting all activities and outcomes

These outputs represent concrete contributions to understanding and improving maternal vaccination communication in Switzerland, providing both immediate practical tools for HCPs and foundational evidence for future intervention development and research.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Key Conclusions

This research-cum-action project successfully generated new evidence on maternal vaccination communication in Switzerland and developed a practical training tool to support HCPs in vaccine counseling during pregnancy.

Evidence Generation on Maternal Vaccination in Switzerland

The project established the first comprehensive evidence base on maternal vaccination communication in the Swiss context, combining HCP and patient perspectives. The HCP assessment revealed important insights into professional identity differences, training gaps, and communication practices that shape vaccine counseling in prenatal care. The identification of "data dumping" as a prevalent communication approach represents a novel finding not previously documented in vaccine communication literature.

The SWIFS 2024 collaboration provided the first nationally representative data on maternal vaccination uptake and decision-making factors in Switzerland. These baseline data revealed substantial variation in uptake between pertussis (70%) and influenza (22%) vaccination, with 13% of mothers reporting they received no vaccination advice during pregnancy. Critically, the data demonstrated that the primary barrier to vaccination is not active opposition or safety concerns, but rather belief that vaccination is "not necessary".

Central Role of HCP Communication

Both assessments converged on a critical finding: HCP recommendation is the single most powerful driver of maternal vaccine acceptance, with 82-91% of vaccinated mothers citing provider recommendation as a key motivator. This finding validates the project's focus on enhancing provider communication skills as the primary intervention strategy and underscores that improvements in how providers communicate about vaccination could substantially impact uptake rates.

Conversely, lack of provider recommendation emerged as a significant barrier, cited by 32-43% of non-vaccinated mothers depending on vaccine type. Combined with evidence that some midwives were taught that vaccine recommendation is "not their responsibility," these findings reveal systematic gaps in counseling coverage and professional role clarity that undermine vaccination efforts.

Practical Tool Development for Swiss Context

The project successfully adapted an evidence-based tiered communication training for use in German-speaking Switzerland, incorporating critical cultural adaptations based on Phase II findings and stakeholder feedback. The 3-part asynchronous online training

provides prenatal care physicians with concrete techniques for initiating vaccine discussions using presumptive approaches adapted to Swiss cultural values of patient autonomy, and employing motivational interviewing when patients express hesitancy.

The training directly addresses the "necessity gap" by teaching providers to frame vaccination as routine prenatal care and by providing structured approaches for respectfully exploring and responding to maternal questions and concerns. The publicly accessible online format supports sustainable dissemination beyond the project period.

Distinct Training Needs Across Provider Groups

A critical finding with implications for future intervention development is that midwives and physicians have different training needs with regards to vaccine communication. Midwives face substantial knowledge gaps (vaccination described as marginal in their education, reliance on self-directed learning, no confidence addressing hesitancy) and professional identity barriers (viewing a neutral, non-directive stance on maternal vaccination as appropriate practice; taught that vaccine recommendation is "not their responsibility"). These barriers cannot be addressed through communication skills training alone but require foundational vaccine education and professional role reconceptualization.

10.2 Key Recommendations

The tiered communication training developed through this project should receive further evaluation and adjustment to ensure its acceptability to physicians. After evaluation and adaptation, we advise generating final, professionally made versions of the training in German, French and Italian for inclusion on the E-VACTS platform.

We also recommend further focus on midwives' role in promoting maternal vaccination. Future research should focus on the two main needs identified by our research: improving midwives basic training about vaccination and reframing promotion of maternal vaccination as a basic part of routine, high-quality prenatal care that midwives can proactively recommend. This reframing may require better integration of vaccination in training for midwives in general.

11. FINANCIAL REPORT

Provided separately.

12. APPENDICES

Appendix A: Project Deliverables

This final project report is accompanied by the following deliverables produced during the project implementation period (August 2023 - November 2025):

Research Reports

1. Master's Monograph: Fontana, L. (2025). *Understanding Communication and Practices Related to Maternal Vaccination – Qualitative Assessment of Swiss Prenatal Health Care Providers Vaccine Discussion and Related Needs*. Master's thesis, University of Basel, November 2025.
2. SWIFS 2024 Final Report: Gomes, D., Riggenbach, V., Ith, N., Lohri, N., Jafflin, K., Aeberli, I., Hersberger, L., & Haile, S.R. (2025). *SWIFS - Swiss Infant Feeding Study 2024: National monitoring on infant feeding in the first year of life*. ZHAW Zurich University of Applied Sciences and Swiss Tropical and Public Health Institute, November 2025.
    - Section 4.2.4 "Vaccination in Pregnancy" presents findings from maternal vaccination questions contributed by this project.

Survey Instruments and Data Collection Tools

3. Healthcare Provider Interview Guide (German and English versions)
    - Semi-structured interview guide exploring: (1) education in vaccination and communication, (2) organization of maternal care and prenatal vaccination services, (3) approaches and techniques for vaccine communication with pregnant patients, and (4) needs regarding vaccine communication
    - Complete interview guide included as appendix to Master's monograph
4. SWIFS 2024 Maternal Vaccination Questions (German, French, Italian, and English versions)
    - Questions addressing: vaccination advice received during pregnancy; influenza and pertussis (Tdap) vaccination uptake during pregnancy; reasons for receiving or not receiving vaccines
    - Integrated into SWIFS 2024 survey instrument, included as appendix to SWIFS Survey Report

Training Tool and Distribution Materials

5. Tiered Communication Training for Maternal Vaccination (German) - 3-part asynchronous online training
    - Module 1: Introduction to Tiered Communication (YouTube video, ~30 minutes)
        - URL: https://youtu.be/FuMDm-Sl8V8
    - Module 2: Mastering the Skills Needed for Tiered Communication (Genially interactive training, ~1 hour)
        - URL: https://view.genially.com/68fcb90719fd7b8160b192b2
    - Module 3: Tiered Communication in Practice (Genially interactive training, ~1 hour)
        - URL: https://view.genially.com/68fcb95e9ad0164060e42713

Dissemination Materials

6. National Vaccination Strategy Workshop Presentation Materials (June 2024)
    - Presentation slides from two working group sessions
    - Summary of feedback from 18 workshop participants
7. Training Distribution Flyer (German)
    - Overview of training purpose, target audience, module descriptions, access links, evidence base, and contact information
    - Distributed to gynecologists in German-speaking Switzerland via professional networks, October 2025