

# Complications Related to Cesarean Delivery, New Jersey 1997-2005

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# Background

Nationally and in New Jersey, cesarean delivery rates have been increasing steadily for a decade.

Consumer advocacy interest surrounding choice and complications.

Media requests for statistics by hospital.



# Cesarean Delivery is a Public Health issue because...

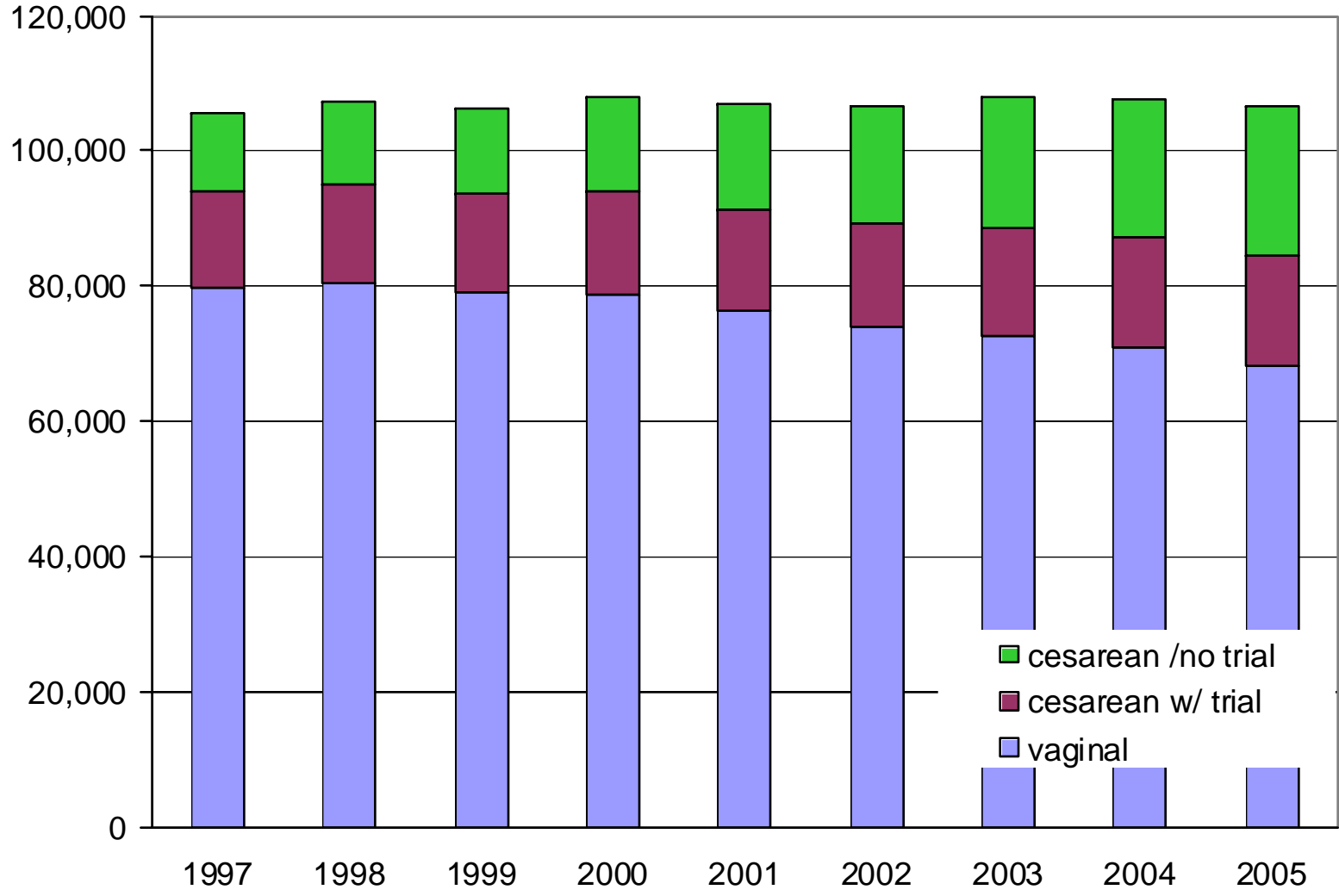
It reflects social elements of information  
and behavior embedded in healthcare.

It reflects organizational parameters of the  
larger healthcare system.

It falls within states' responsibilities for  
regulation and capacities for surveillance.



# Live Births by Method of delivery



## 2005 Study of Utilization: Summary

- Primary and repeat cesareans increased at similar rates, stratified by medical indication.
- Cesareans without a trial of labor showed the fastest growth.
- Cesarean without any recorded medical reasons are rising, but still a small component.
- Changes in maternal risk factors are another modest component.



# Current Study Question & Objectives

Are trends in the incidence of cesarean-related complications parallel to the overall growth in cesarean utilization?

- Overall trends
- Relation to method of delivery
- Trends in relative risk



# Perinatal Surveillance System

## Electronic Birth Certificate Program

- Administered by states
- More than 400 fields (NJ) abstracted from prenatal care and hospital charts
- Delivery hospital is responsible
- Standardized electronic data entry and submission since 1996



# Perinatal Surveillance System

## Hospital Discharge Files

- Diagnoses & procedures:
  - ICD-9-CM coding
  - More specific and extensive than EBC
- Linked to birth certificates using probabilistic methods
- Also captures events causing rehospitalization within 60 days





# Vaginal vs. Cesarean Delivery: An Array of Risks

## Maternal Risks

- short term to long term  
*hemorrhage / future  
placenta accreta*
- physical to psychosocial  
*infection / sexual  
dysfunction*
- minor to acute  
*episiotomy / maternal death*

## Neonatal Risks

- short term to long term  
*TTN / failed breastfeeding  
effort*
- physical to psychosocial  
*birth trauma / impact on  
bonding*
- minor to acute  
*cephalohematoma /  
neonatal death*

Our surveillance data refer to short term, physical, and acute conditions. Maternal complications today; neonatal later...



# Major post-partum infection

- Major puerperal infections
  - ICD-9 670.0
  - Peritonitis, septicemia, endometritis, pelvic sepsis...
- Excludes
  - Wound-specific infections in 674.3
  - Genitourinary infections in 646.6



# Major systemic complications

- Anesthetic complications
  - ICD-9 668.0-2
- Maternal distress, shock
  - ICD-9 669.0-1
- Renal failure
  - ICD-9 669.3
- Cardiac arrest, anoxia...
  - ICD-9 669.4



# Vascular complications

- Deep vein thrombosis, post-partum
  - ICD-9 671.4
- Embolism
  - ICD-9 673
- Cerebrovascular disorders
  - ICD-9 674.0



## Trauma to tissues

- Surgical wound complications
  - ICD-9 674.1-3
- 3rd & 4th degree lacerations to perineum and vulva
  - ICD-9 664.2-3
- Other trauma
  - Other lacerations 664.4, 665.3-4
  - Hematoma 664.5, 665.7



# Hemorrhage and related procedures

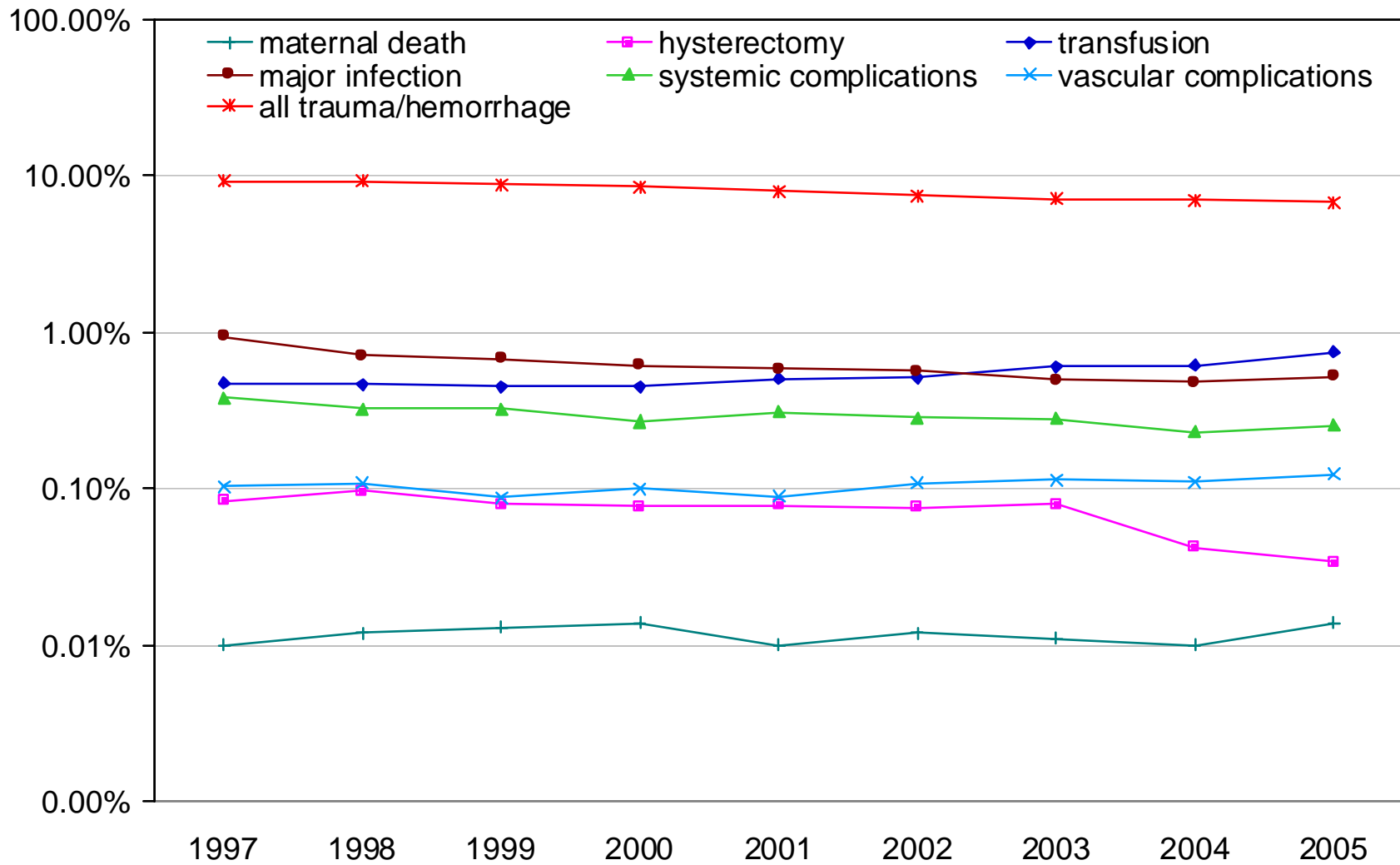
- Postpartum hemorrhage; ICD-9 666

Indicators of most severe hemorrhage and/or trauma:

- Transfusion, ICD-9 99
- Hysterectomy, ICD-9 68.3-7,9



## Post-Partum Complications, All Deliveries



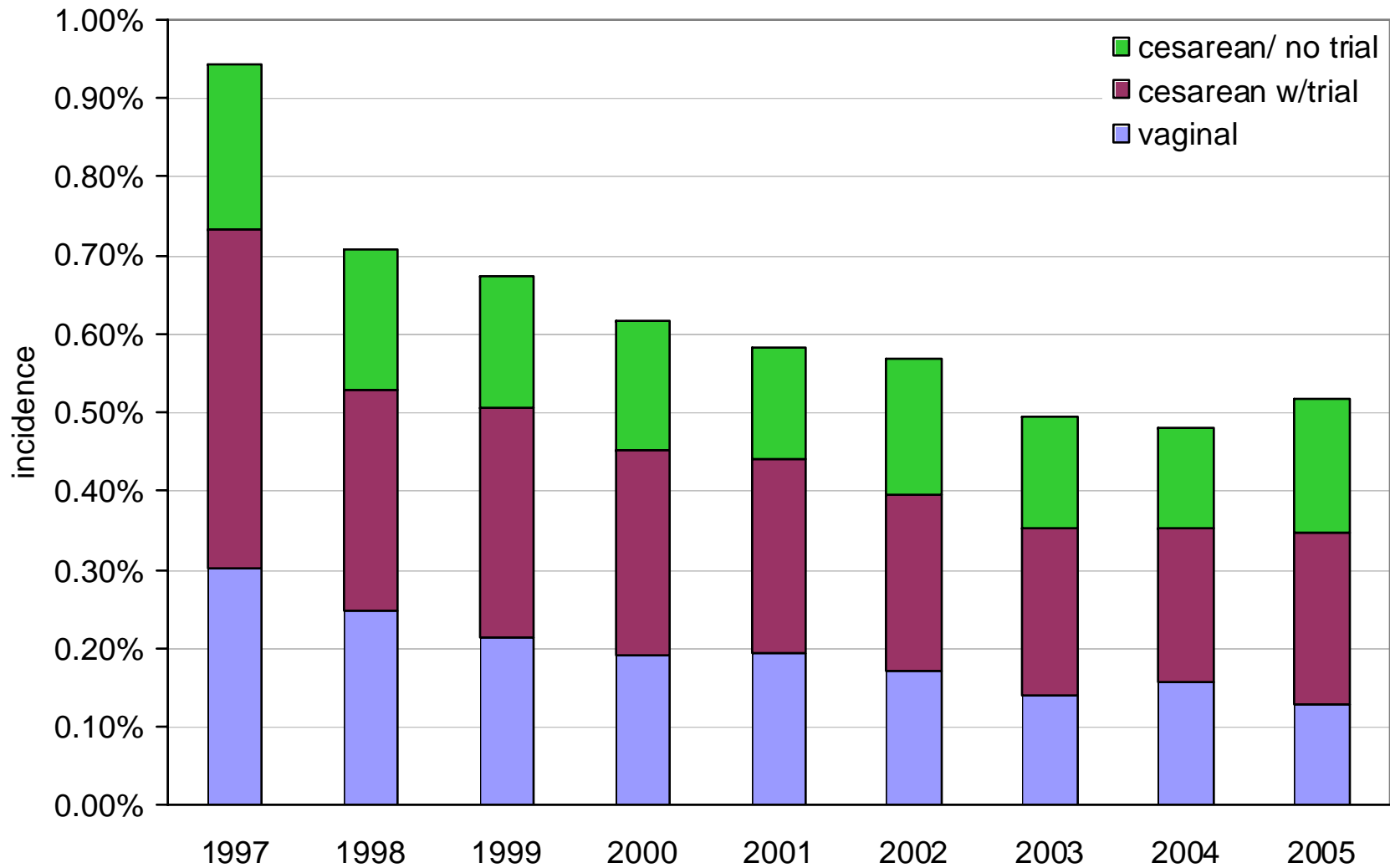
## Relation to Method of Delivery

- Denominators in some graphs are all live births in year
- Increasing volume of cesareans may drive these rates up, but
- Method-specific risks may change, too
- Denominators in 2nd graph in each pair are live births by specific method

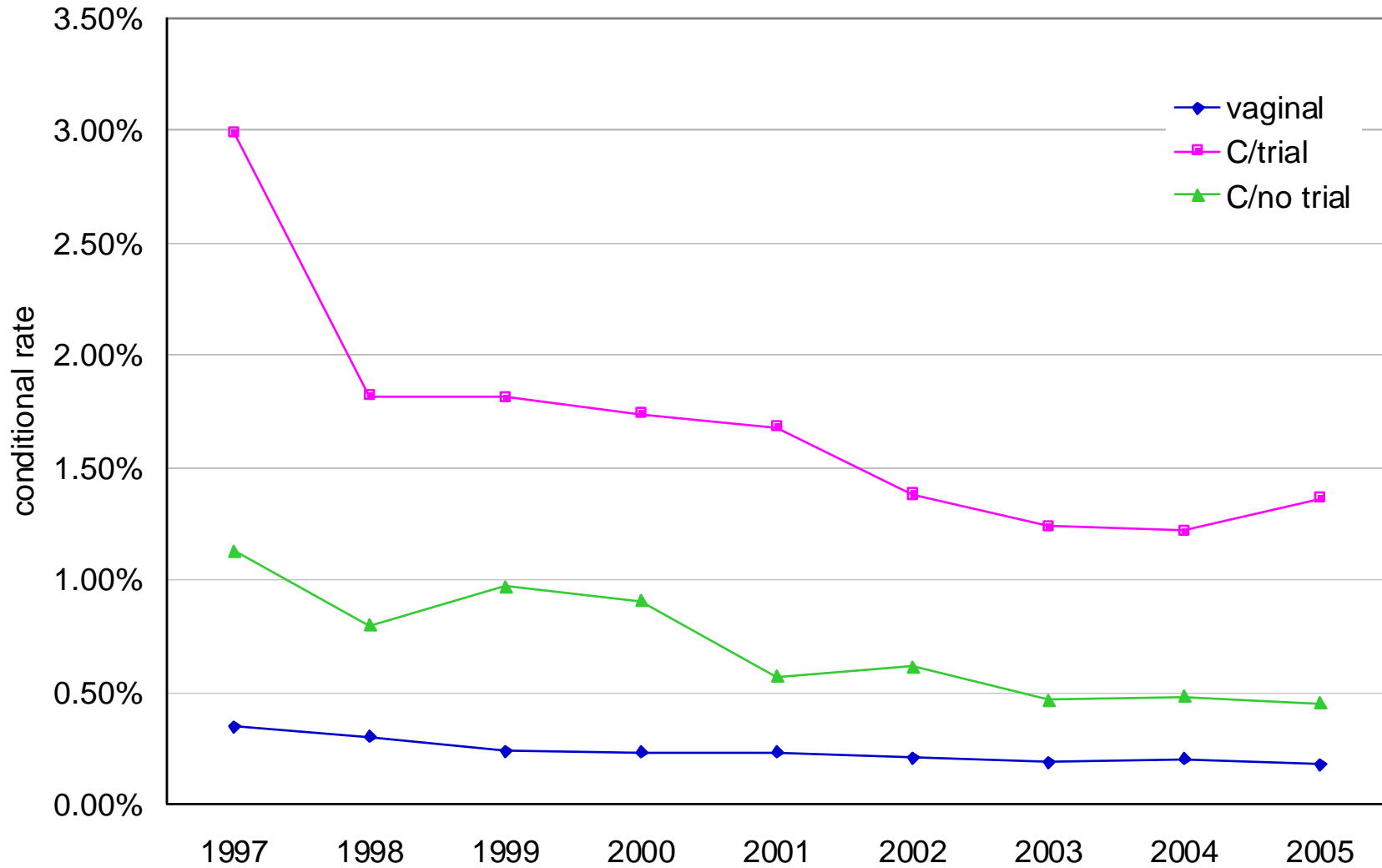




## Major Infection by Method of Delivery



# Major Infection, Low-risk Deliveries

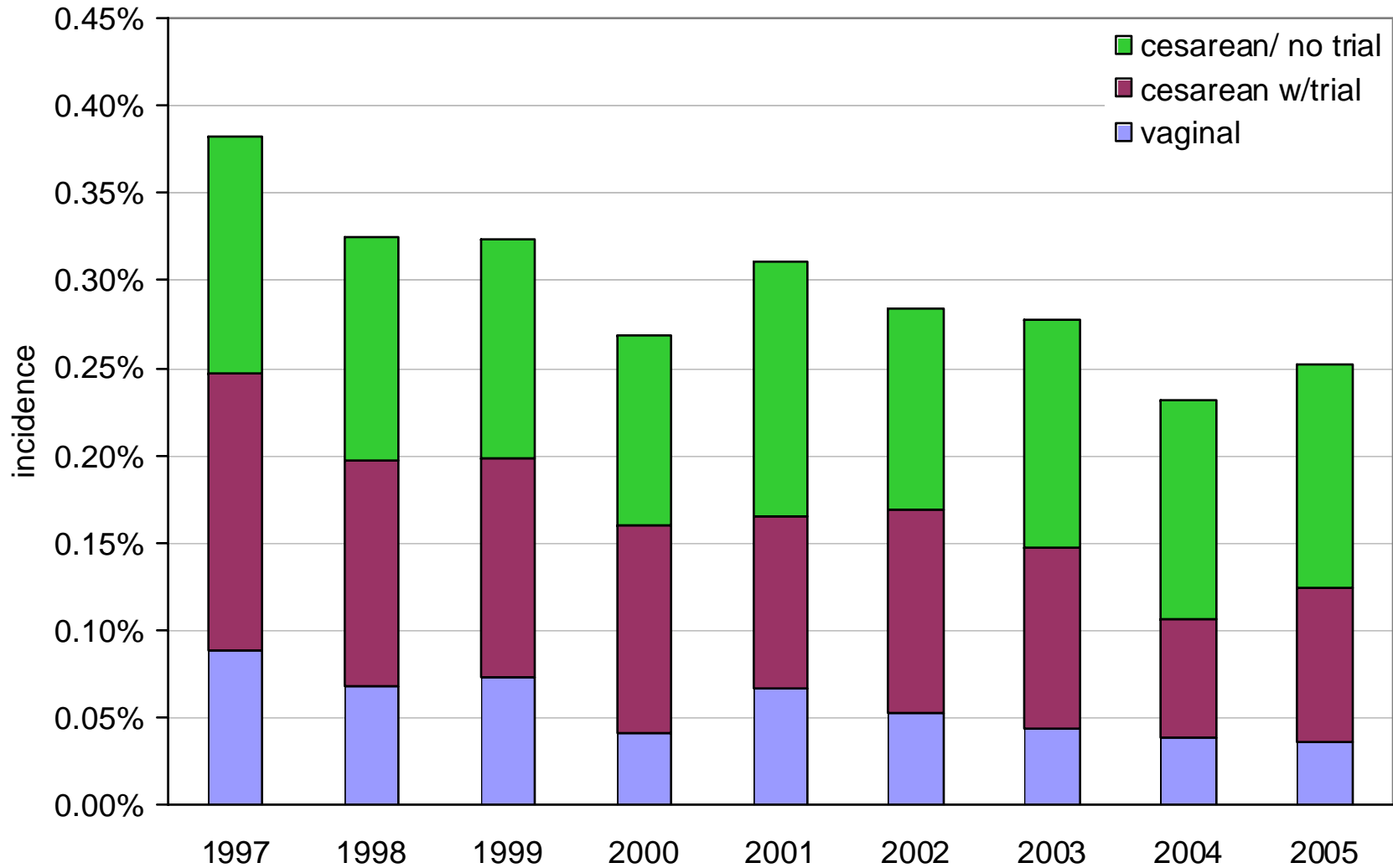


# Confounding: Is Cesarean Cause or Effect?

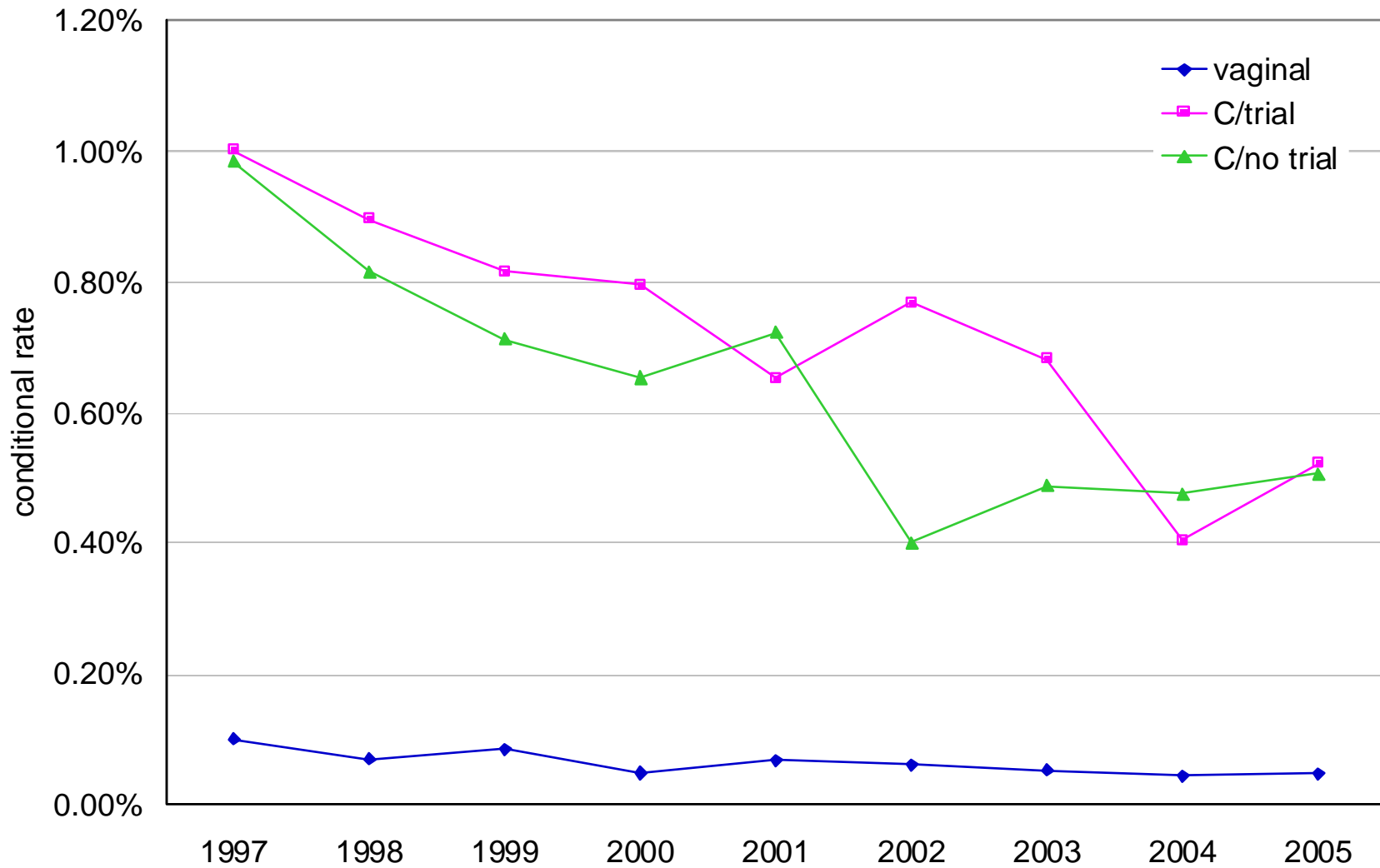
- Cesarean and post-partum adverse event may both be result of the same underlying cause
- To avoid *confounding by indication*, we consider only deliveries at low antepartum risk of cesarean and/or complication
  - singleton, full term, head down
  - no serious antepartum bleeding, severe hypertension, preeclampsia/eclampsia, uterine tissue abnormality, macrosomia



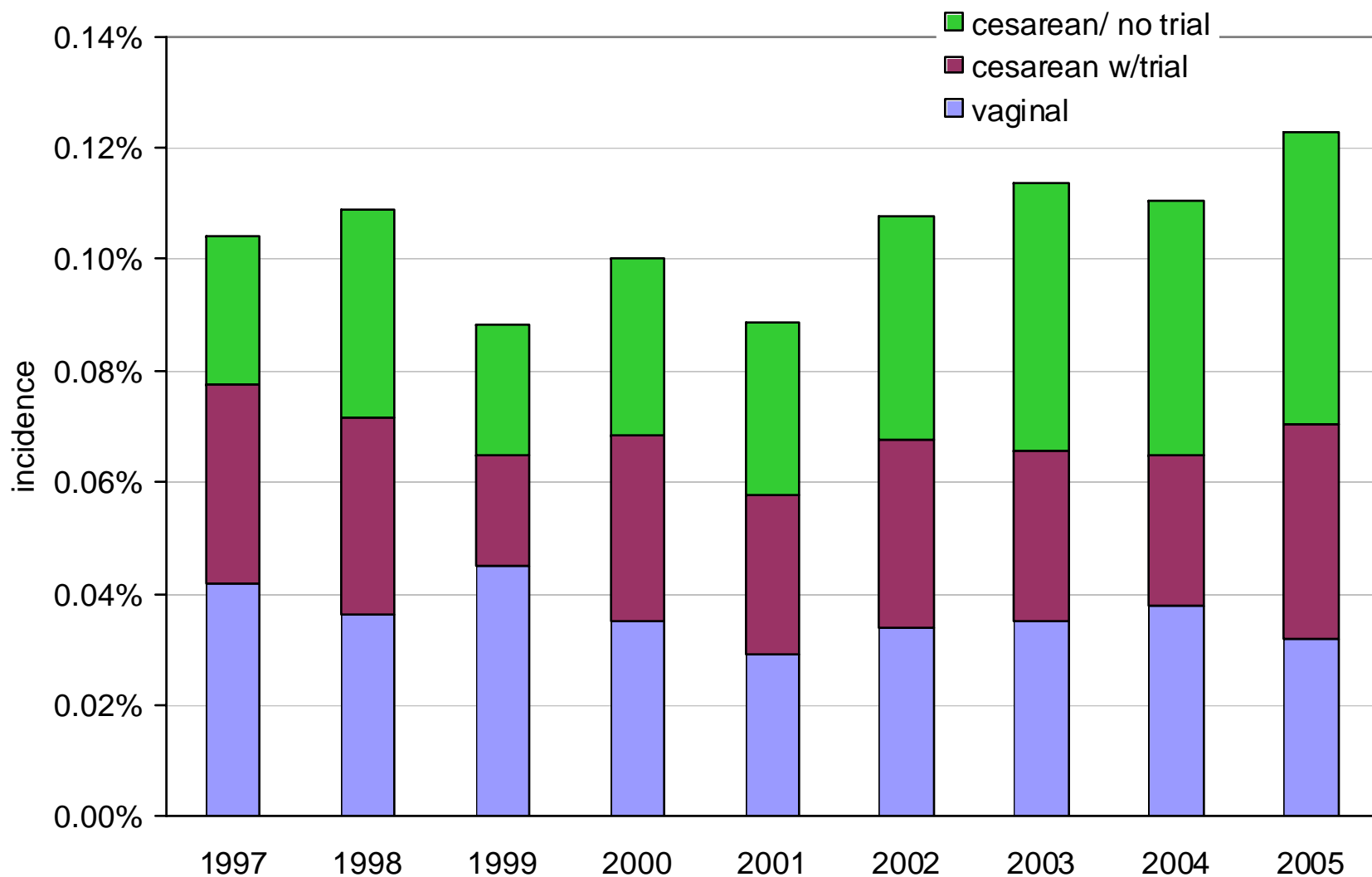
## Systemic Complication by Method of Delivery



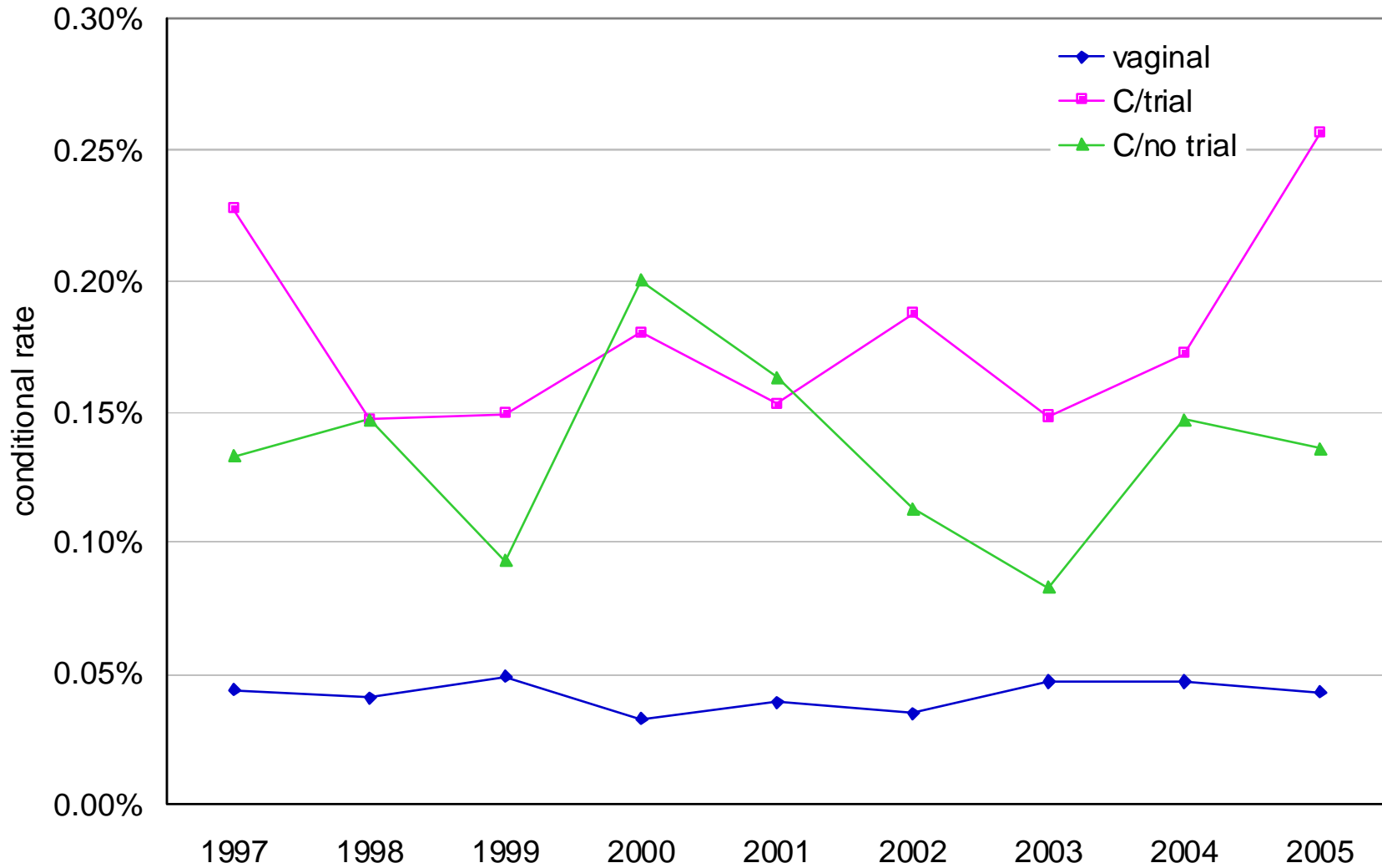
## Systemic Complication, Low-risk Deliveries



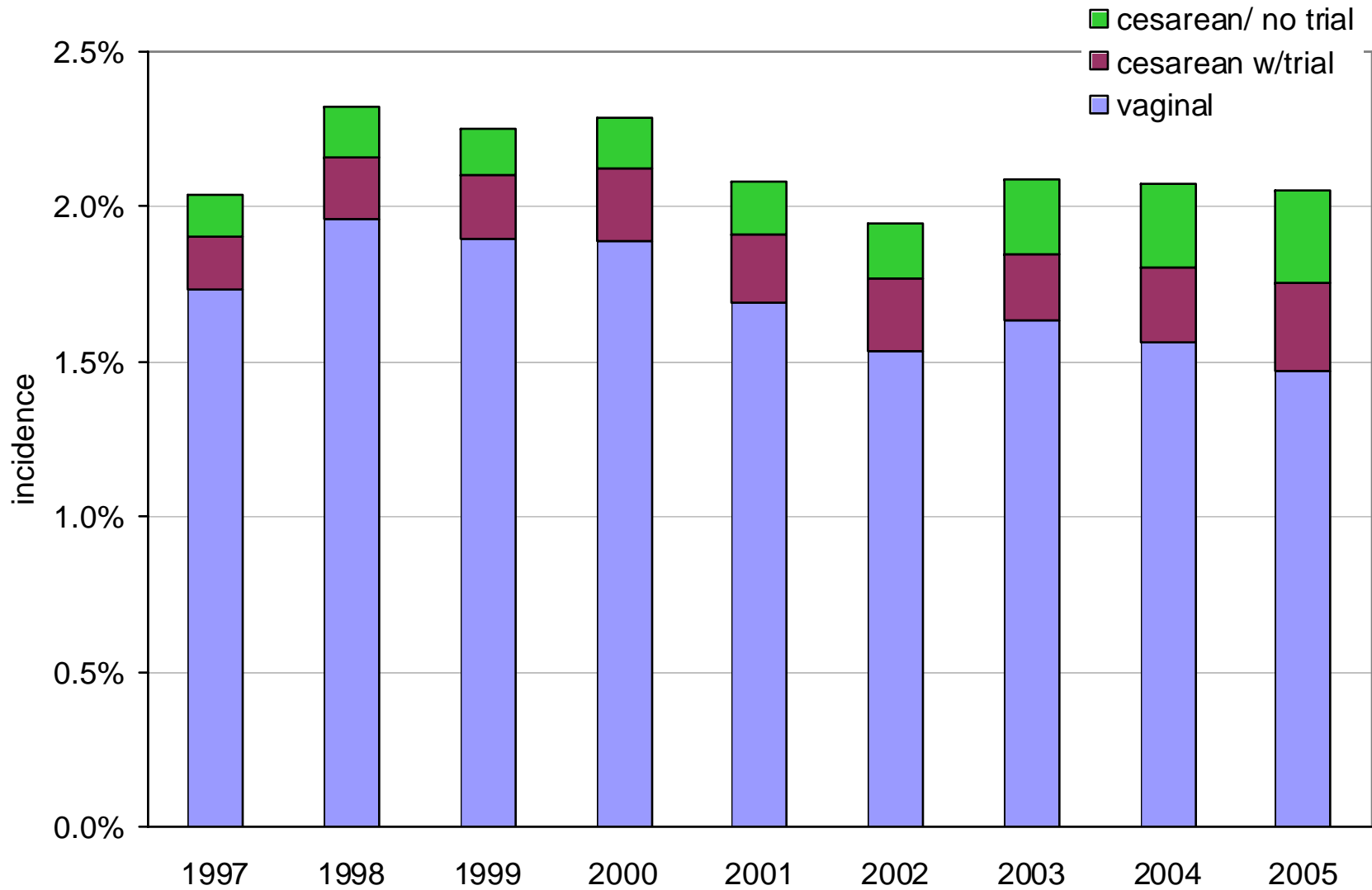
## Vascular Complication by Method of Delivery



## Vascular Complication, Low-risk Deliveries

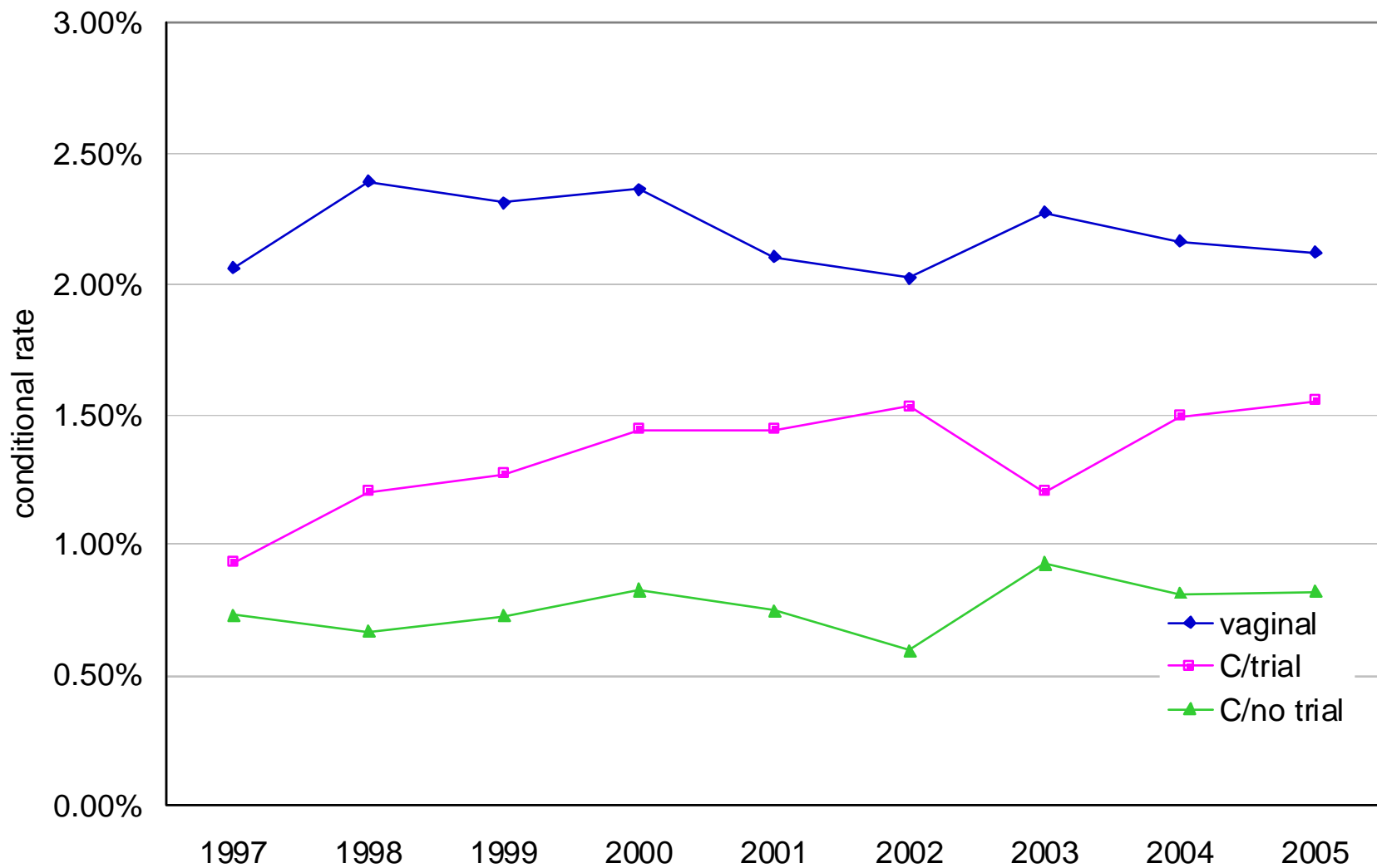


## Post-Partum Hemorrhage by Method of Delivery

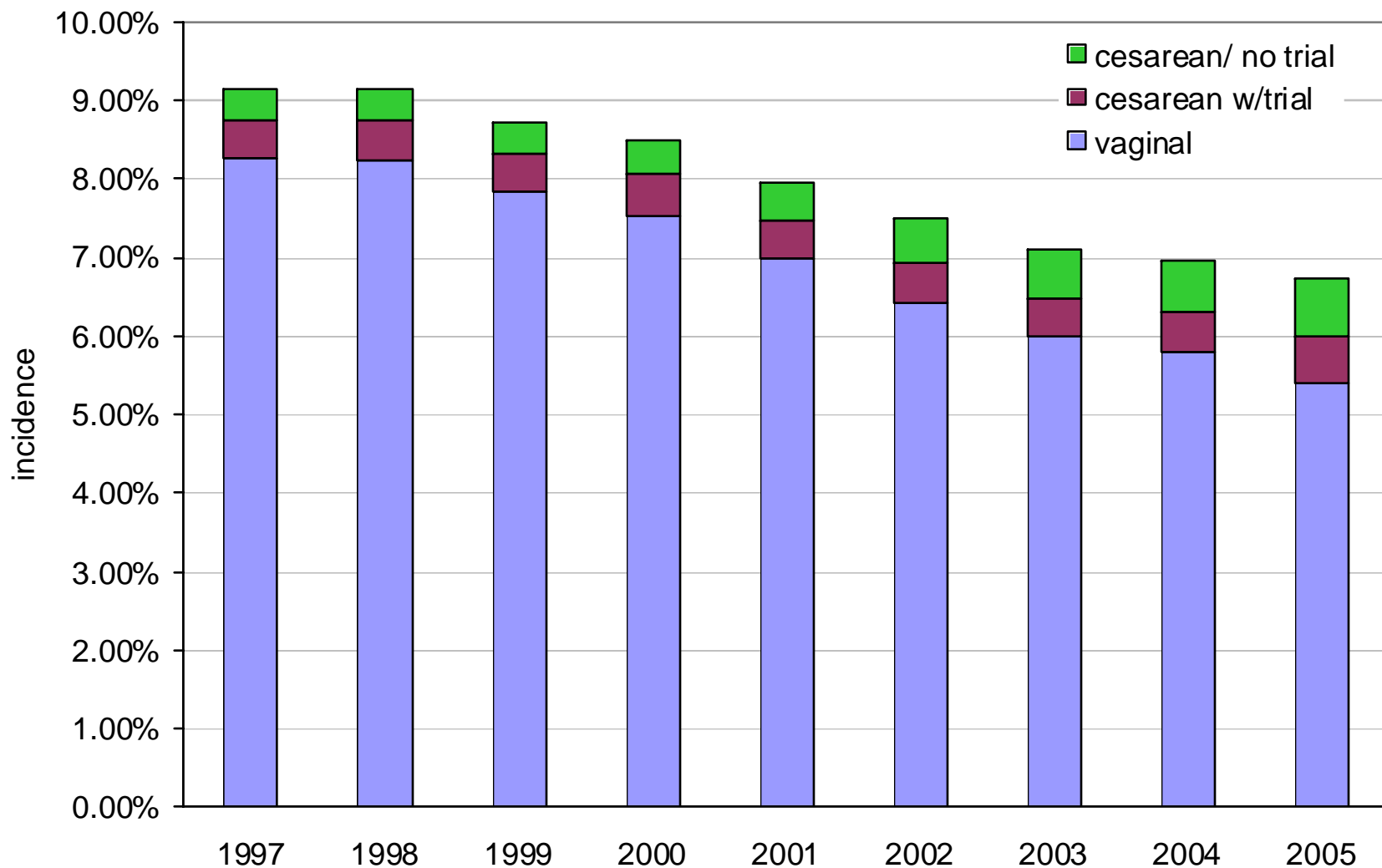




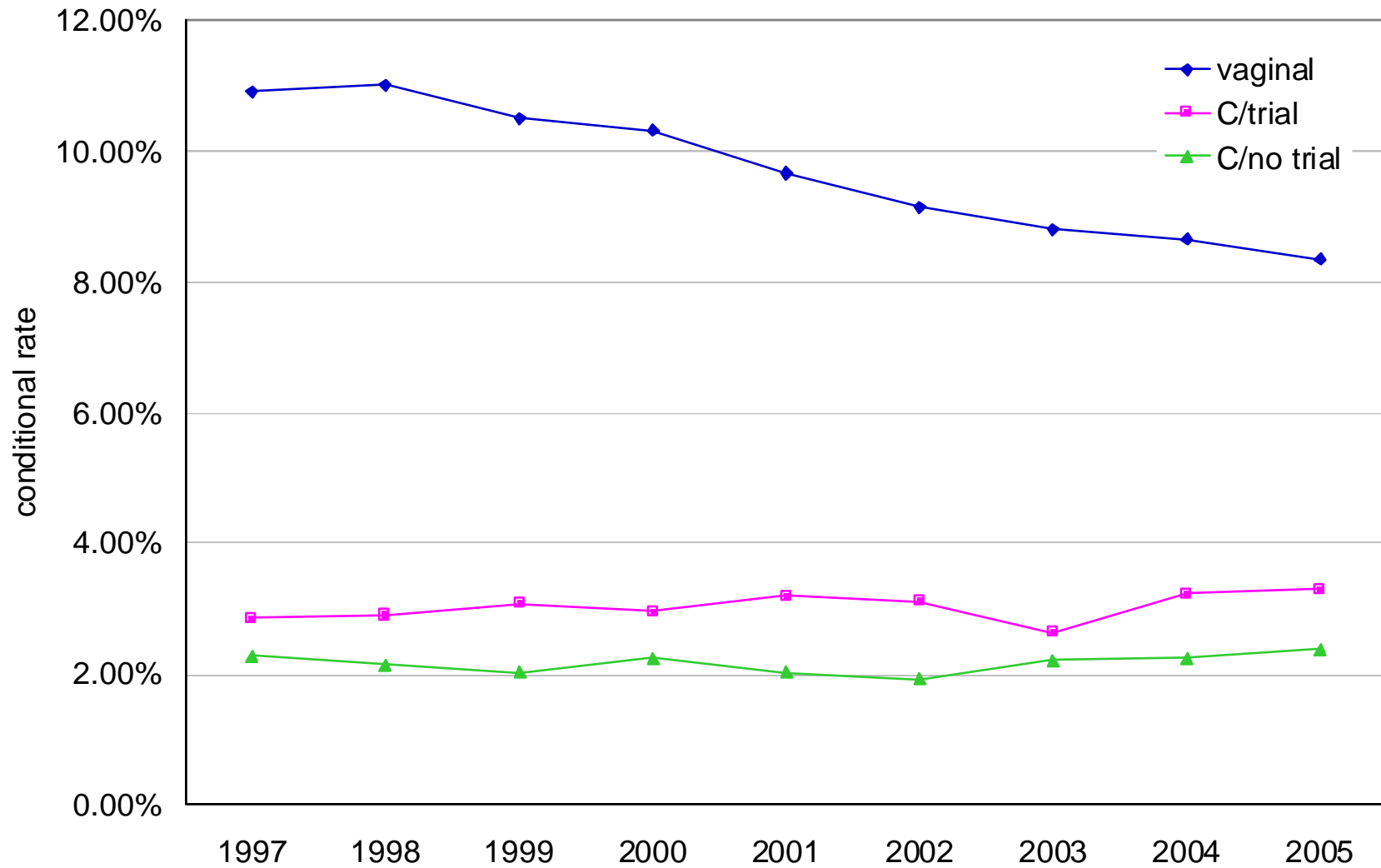
## Hemorrhage, Low-risk Deliveries



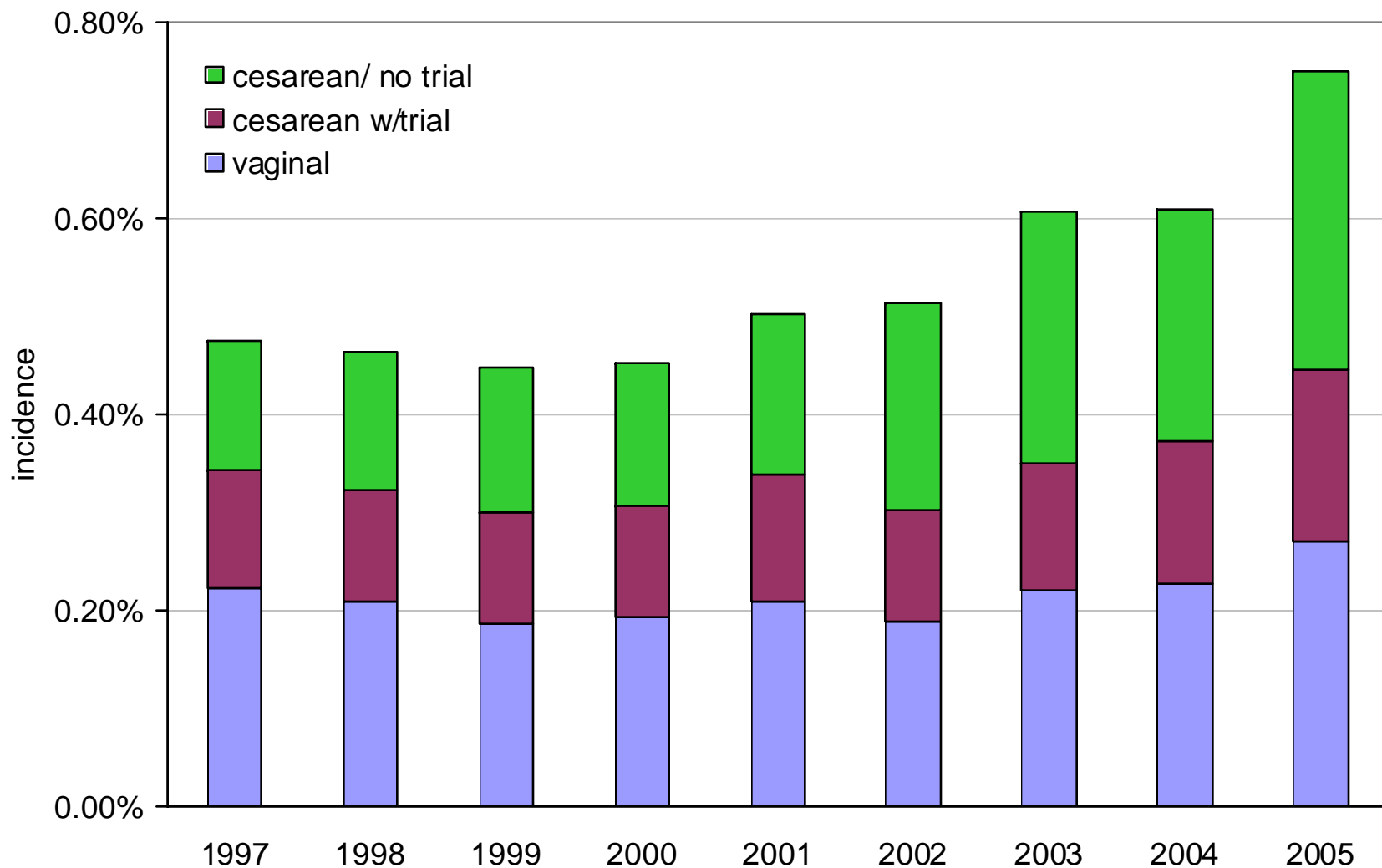
## All Traumas by Method of Delivery



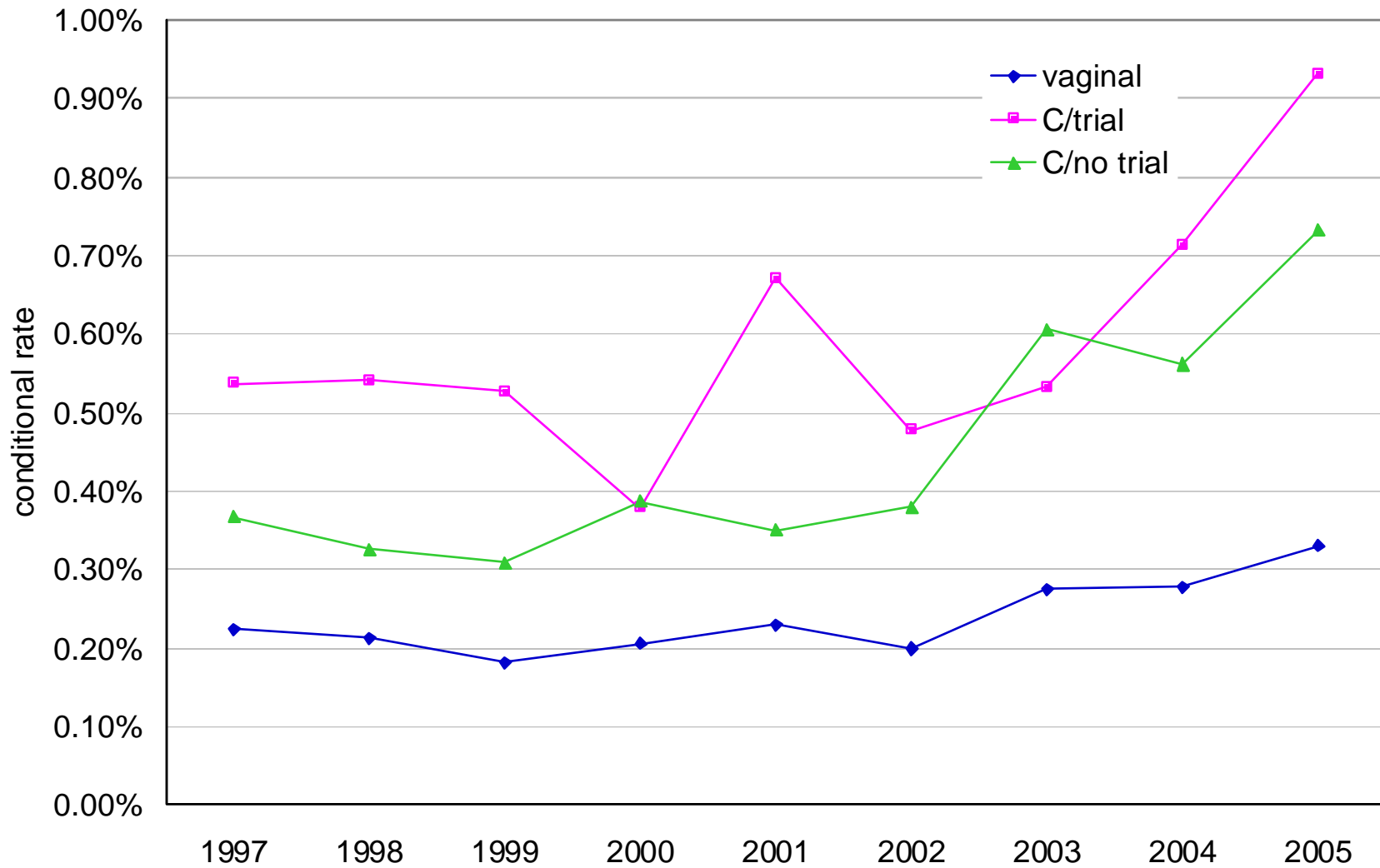
## All Traumas, Low-risk Deliveries



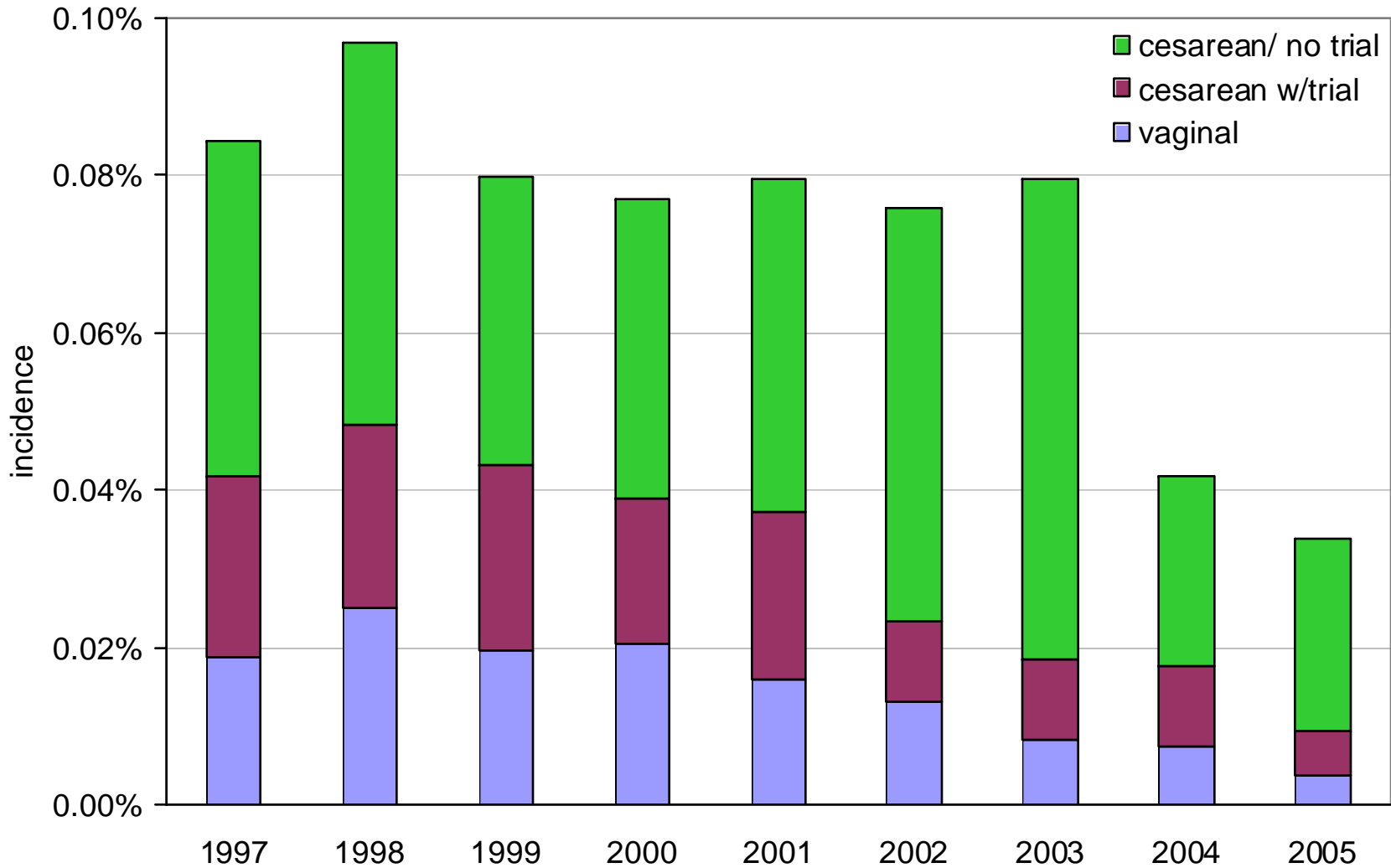
## Transfusion by Method of Delivery



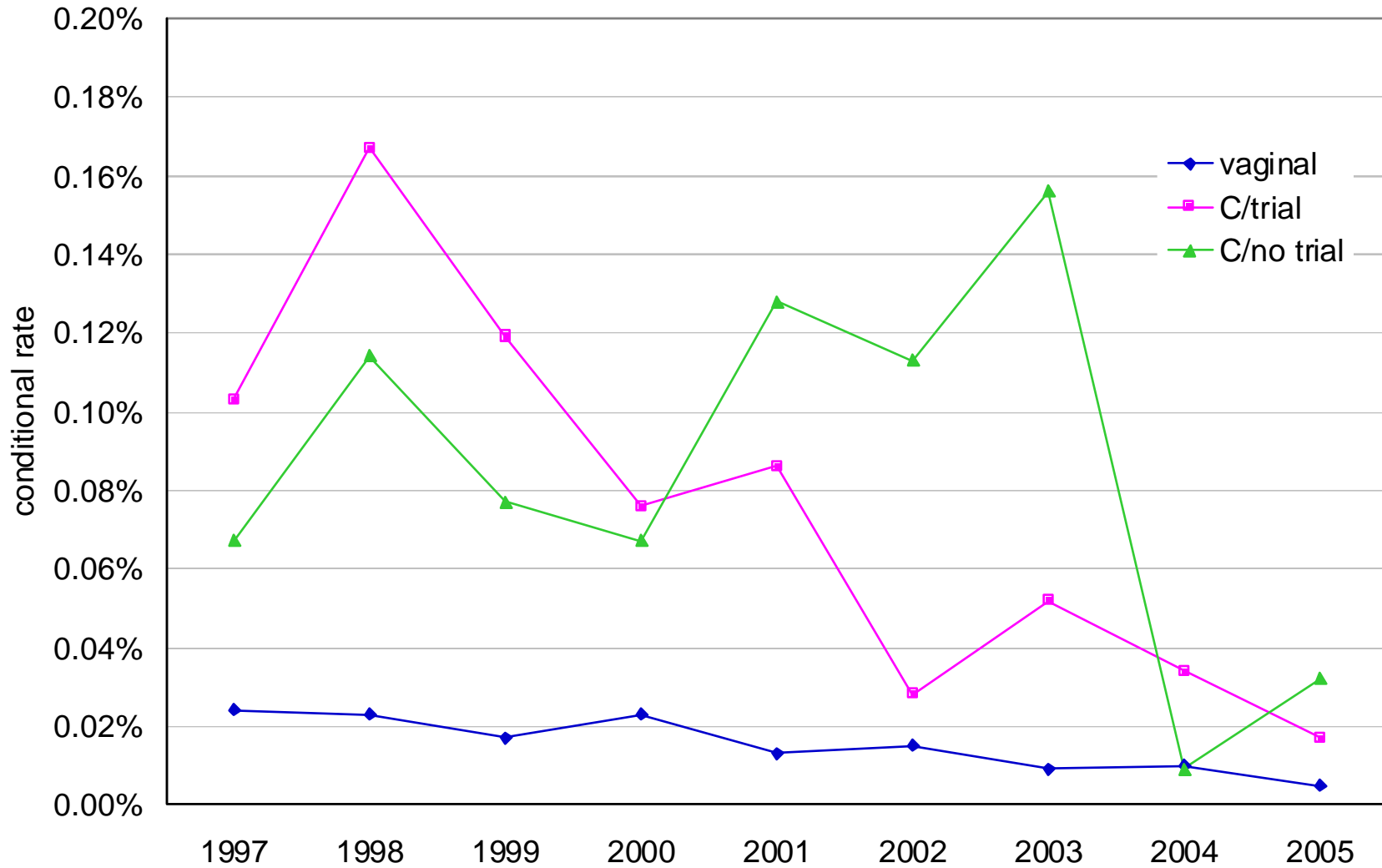
## Transfusion, Low-risk Deliveries



# Hysterectomy by Method of Delivery



# Hysterectomy, Low-risk Deliveries



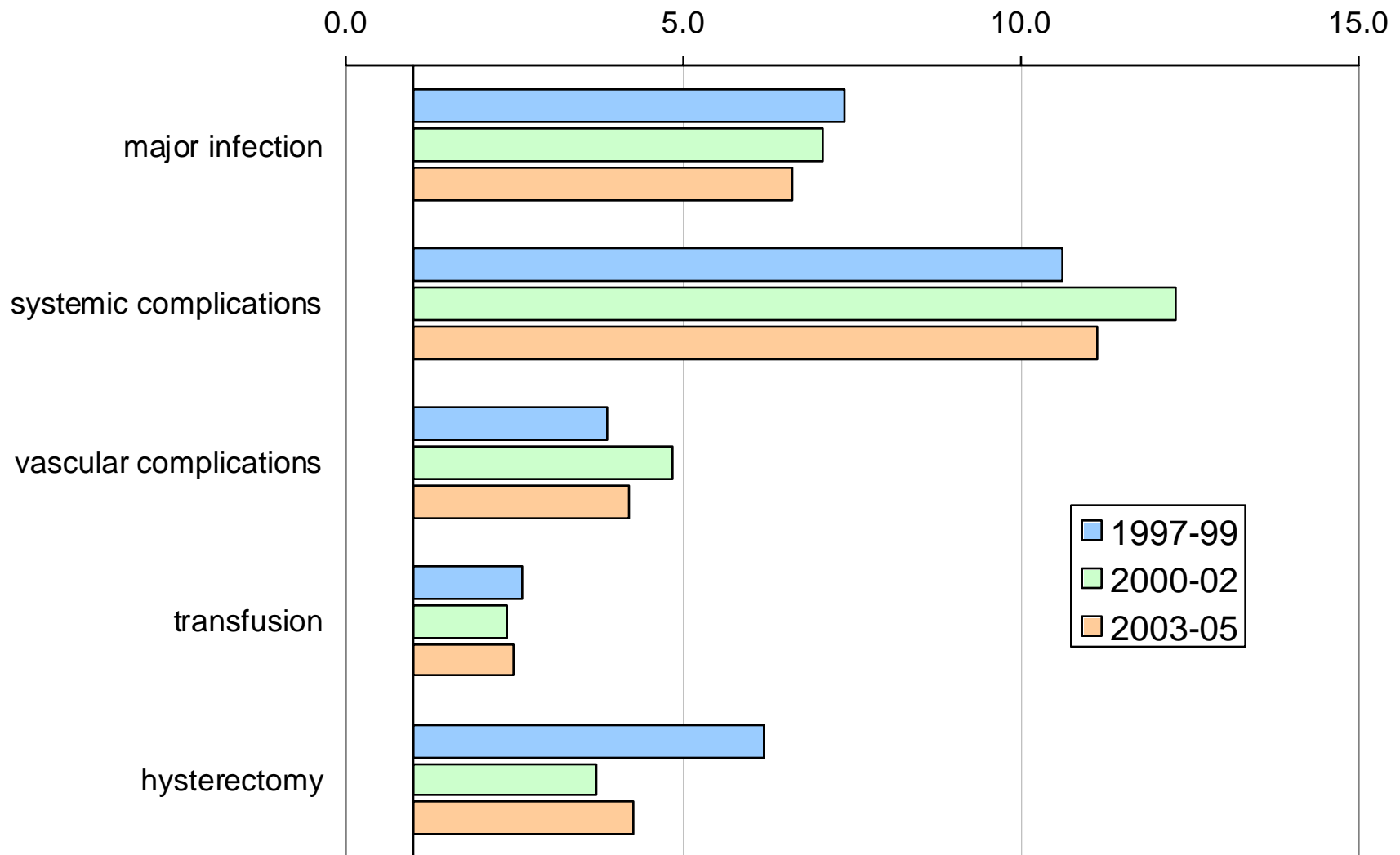
## The Question?

- If absolute rates for many complications are down significantly, is cesarean delivery relatively less risky compared to vaginal delivery?

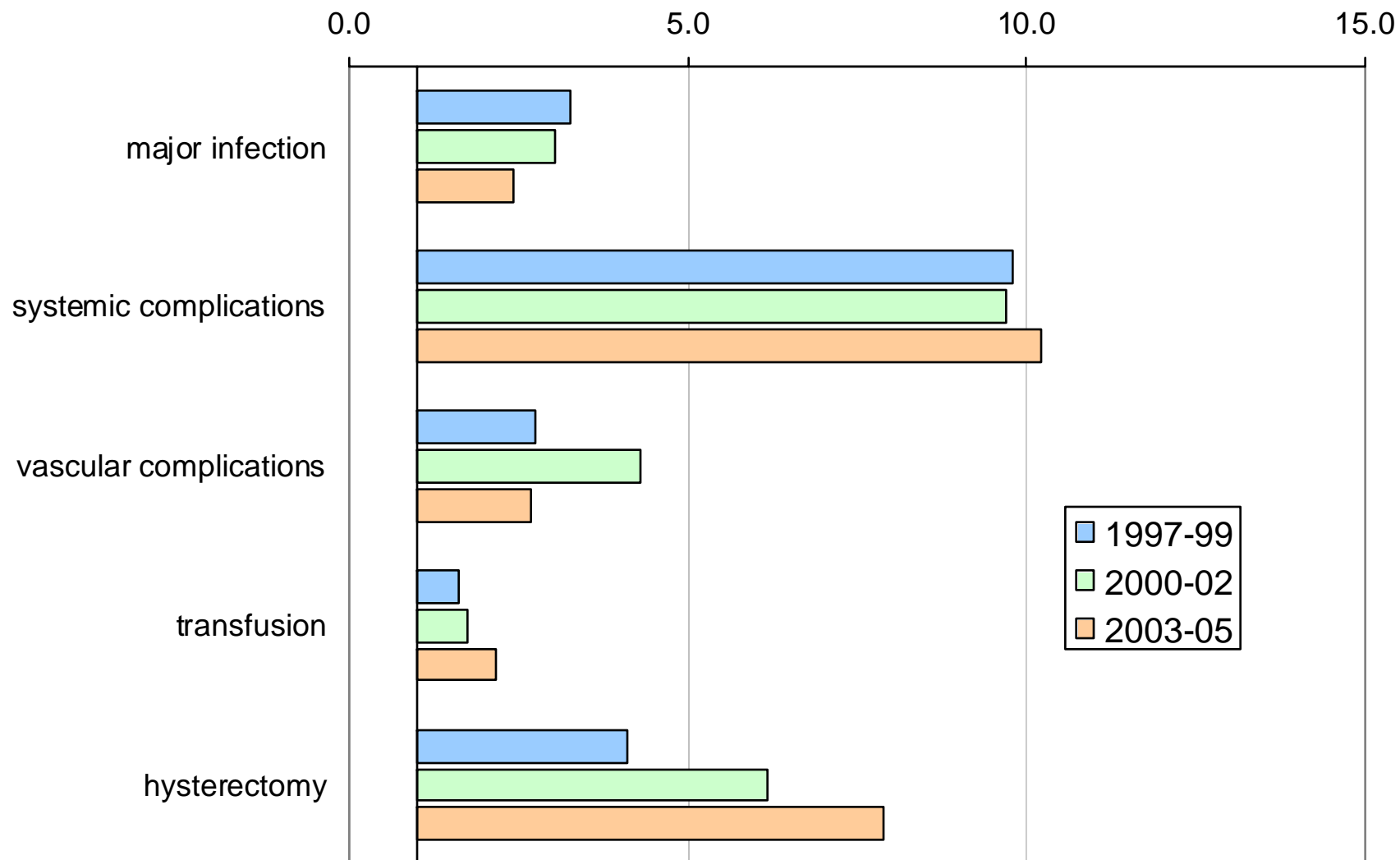




## Relative risk: Cesarean after trial labor v. Vaginal delivery Low-risk Deliveries



## Relative risk: Cesarean without trial labor v. Vaginal delivery Low-risk Deliveries



## Summary and research agenda

- Risk of infection and systemic complication declined for all methods of delivery.
- Risk of transfusion increased.
- Which declines are due to improved prenatal and delivery care?
- Which declines reflect selection effects, ie, cesarean for healthier women?



# Implications

- Improvements are impressive.
- Cesarean surge has not increased complications.
- Relative risks associated with cesarean have not changed.
- According to two leading NJ obstetricians: “Maybe we should reimburse vaginal deliveries at premium rates. They require more effort and a wider array of skills.”

