M50 MATHEMATICA Policy Research

IssueBRIEF

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Societal Costs of Untreated Perinatal Mood and Anxiety Disorders in Colorado

Summary. Although perinatal mood and anxiety disorders (PMADs), which include depression and anxiety disorders during pregnancy and postpartum, are common among mothers in Colorado and the United States, these medical conditions often go undiagnosed and untreated.[1,2] While PMADs have received increasing attention from policymakers and professional societies, the societal costs have not been well documented. This issue brief describes the findings from a new mathematical model that quantifies the societal costs[3] of untreated PMADs from conception to age 5. The model uses the most recent data and credible estimates of maternal, child, and societal outcomes associated with untreated PMADs from peer-reviewed literature. We estimate that the total societal cost of untreated PMADs in Colorado is $199 million for all births in 2017 when following the mother-child pair from pregnancy through five years postpartum.

CONTEXT

- In Colorado, PMADs affect roughly 9 percent of pregnant and postpartum women.[4]
- PMADs affect at least 1 in 7 pregnant and postpartum women nationwide, making them the most common obstetric complication in the United States.[5,6]
- These conditions often go undiagnosed and untreated, despite the existence of screening tools and effective treatments.[7] In fact, only 50% of perinatal women who are diagnosed with depression receive any treatment.
- When left untreated, PMADs can become a multigenerational issue, negatively affecting the mother and child's long-term physical, emotional, and developmental health.

RESEARCH RATIONALE AND SYNOPSIS

To our knowledge, this mathematical model presents the most comprehensive analysis to date of the economic burden of PMADs in the United States and Colorado. To construct the model, we compiled the most recent peer-reviewed literature and secondary data sources to quantify the societal costs of not treating PMADs. We collected data on the prevalence of PMADs, the outcomes associated with untreated PMADs, and the costs and baseline rates of each outcome. With this information, we created a total cost estimate for all U.S. and Colorado births in 2017 when following the mother-child pair from pregnancy through five years postpartum.

Figure 2 presents our conceptual framework of how untreated PMADs influence maternal, child, and societal outcomes. As the framework shows, our model reflects the societal costs of untreated PMADs through three primary domains: (1) maternal productivity loss; (2) greater use of public sector services, including welfare and Medicaid costs; and (3) higher health care costs attributable to worse maternal and child health. These outcomes have been shown in the literature and recognized by subject matter experts to be linked to PMADs.

Key takeaways
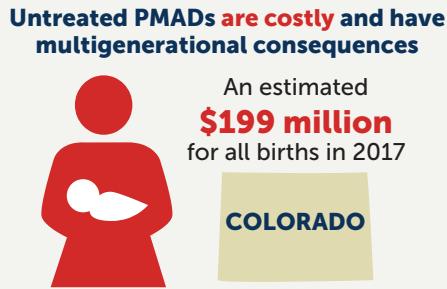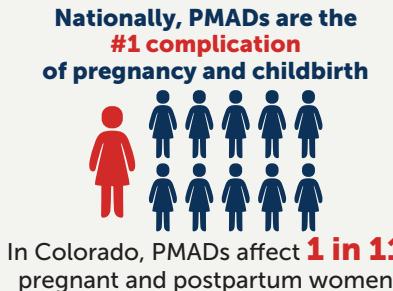
Nationally, PMADs are the #1 complication of pregnancy and childbirth

In Colorado, PMADs affect **1 in 11** pregnant and postpartum women

Untreated PMADs are costly and have multigenerational consequences

An estimated **$199 million** for all births in 2017

COLORADO

**Nationally, half of perinatal women with a diagnosis of depression do not get the treatment they need**

Figure 1.

PRINCETON, NJ - ANN ARBOR, MI - CAMBRIDGE, MA - CHICAGO, IL - OAKLAND, CA - SEATTLE, WA
TUCSON, AZ - WASHINGTON, DC - WOODLAWN, MD
EDI: HIGH WYCOMBE, UK - BUKOBA, TANZANIA - DAR ES SALAAM, TANZANIA

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Conceptual model of how untreated PMADs influence maternal, child, and societal outcomes

Figure 2.

2017 societal costs
of PMADs

Maternal outcomes 53%

Child outcomes 47%
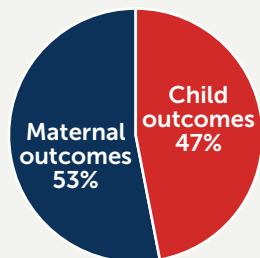
Average cost per mother-child pair:
$34,690

Per mother cost:
**$18,520**

Per child cost:
$16,170
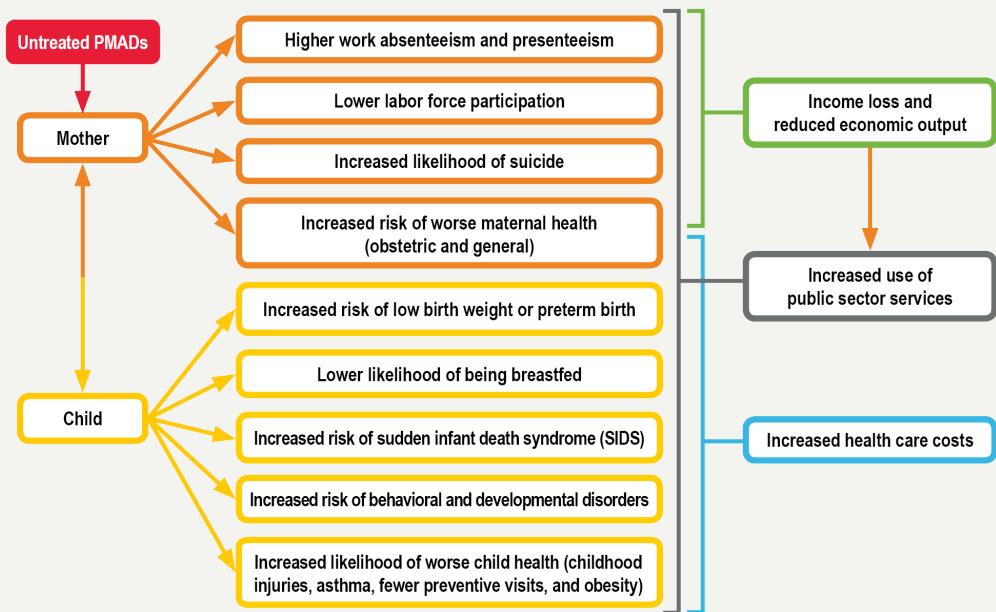
Figure 3.

KEY FINDINGS

The model estimates that the total societal cost of PMADs in Colorado for all births in 2017 is $199 million (Figure 1). This amounts to nearly $35,000 in societal costs per mother with PMAD over a six-year time frame. About 53 percent of the societal costs can be attributed to maternal outcomes, with the largest costs coming from productivity losses ($57 million), maternal health expenditures ($35 million), and obstetric-specific health expenditures[8] ($9 million) (Figures 3 & 4). The remaining 47 percent of costs are related to child outcomes, with the largest costs coming from child behavioral and developmental disorders ($45 million), preterm births ($39 million), and child injury ($3 million) (Figures 3 & 4). Nearly half of these costs (48 percent or $95 million) occur during the first year, and they are associated with pregnancy and birth complications (for example, preterm birth and other obstetric health expenditures).

SOCIETAL COSTS IN THE US AND IN COLORADO

We estimated that the total societal cost per affected mother-child pair is nearly $35,000, which is higher than the national average of

$32,000. The largest cost driver in Colorado and nationally is reduced economic productivity among affected mothers ($57 million in Colorado, and $4.6 billion in the United States).

- **Comparable conditions.** PMADs are not only common, they are among the most costly conditions during pregnancy and postpartum. Examining only medical costs (excluding labor force and social services costs), PMADs cost $15,811 per Coloradoan mother-child pair over a six-year time frame. Other perinatal conditions, such as postpartum hemorrhage and gestational diabetes, each cost up to $3,300 per mother.[9, 10]

- **Conclusion.** Our model demonstrates that the total societal cost of not treating PMADs is substantial ($14.2 billion in the U.S. and $199 million in Colorado) and that most of the costs are borne by employers and health care payers. Several medical societies (including the American College of Obstetricians and Gynecologists, the American Academy of Pediatrics, the American Psychiatric Association, and the Association of Women's Health, Obstetric, and Neonatal Nurses) recommend consistently screening and providing comprehensive treatment for women diagnosed with PMADs. Efforts to decrease the prevalence of

Estimates of societal costs of PMADs for births in 2017: Colorado vs. United States

Outcome	Cost estimate (in million $)	
	Colorado	United States
Maternal		
Productivity losses	$57	$4,652
Health expenditures*	$35	$2,932
Cesarean delivery	$5	$408
Peripartum stay	$4	$271
Suicide	$4	$204
Benefit receipt	$2	$168
Preeclampsia	$0.3	$20
Child		
Child behavioral and developmental disorders	$45	$1,551
Preterm birth	$39	$3,306
Child injury	$3	$306
ED visits	$3	$202
Asthma	$2	$123
Breastfeeding	$1	$74
Childhood obesity	$0.3	$31
SIDS	$0.1	$11
Well-child care visits[11]	$-1	-$101
Total Cost (in billions $)	**$0.2**	**$14.2**

*Maternal health expenditures consist of all health care costs (including mental health), but do not include obstetric costs (reported separately).

Top maternal and child costs for Colorado

$57 Million in productivity losses

$35 Million in maternal health expenditures

$45 Million in child behavioral and developmental disorder costs

$39 Million in preterm births

Figure 4.

PMADs would not only positively impact the health of mothers and their children, but also lead to improvements in women's productivity and decreased usage of social services. This would in turn benefit governments, employers, and health insurance payer groups. It is important for each of these stakeholders to support pregnant and postpartum women, including consistent screening during pregnancy up through the first year postpartum and access to effective and affordable treatment options.

ENDNOTES

1 Elisei, S., E. Lucarini, N. Murgia, L. Ferranti, and L. Attademo. "Perinatal Depression: A Study of Prevalence and of Risk and Protective Factors." *Psychiatria Danubina*, vol. 25, 2013, pp. S258–S262.

2 Cox, E.Q., N.A. Sowa, S.E. Meltzer-Brody, and B.N. Gaynes. "The Perinatal Depression Treatment Cascade: Baby Steps Toward Improving Outcomes." *Journal of Clinical Psychiatry*, vol. 77, no. 9, 2016, pp. 1189–1200.

3 Societal costs include direct costs, such as medical costs, and indirect costs, such as lost work time.

4 Ko, J. Y., and K. M. Rockhill. "Trends in Postpartum Depressive Symptoms—27 States, 2004, 2008, and 2012."

5 Gavin, N.I., B.N. Gaynes, K.N. Lohr, S. Meltzer-Brody, G. Gartlehner, and T. Swinson. "Perinatal Depression: A Systematic Review of Prevalence and Incidence." *Obstetrics & Gynecology*, vol. 106, no. 5 pt. 1, 2005, pp. 1071–1083.

6 US Preventive Services Task Force. "Interventions to Prevent Perinatal Depression: US Preventive Services Task Force Recommendation Statement." *JAMA*, vol. 321, no. 6, 2019 pp. 580–587. doi:10.1001/jama.2019.0007

7 Ko, J.Y., S.L. Farr, P.M. Dietz, and C.L.N Robbins. "Depression and Treatment Among U.S. Pregnant and Nonpregnant Women of Reproductive Age, 2005–2009." *Journal of Women's Health*, vol. 21, no. 8, 2012, pp. 830–836.

8 Obstetric-specific health expenditures include cesarean delivery, peripartum stay, and preeclampsia.

9 UCLA Center for Health Policy Research. "Cost of Maternal Hemorrhage in California." October 2013. Available at http://healthpolicy.ucla.edu/publications/Documents/PDF/maternalhemorragereport-oct2013.pdf. Accessed February 13, 2019.

10 Chen, Y., W. Quick, W. Yang, Y. Zhang, A. Baldwin, J. Moran, V. Moore, N. Sahai, and T. Dall. "Cost of Gestational Diabetes Mellitus in the United States in 2007." *Population Health Management*, vol. 12, no. 3, 2009, pp. 165–172.

11 This outcome most likely results in worse overall child health, as reflected in higher costs in the other child health categories.

Morbidity and Mortality Weekly Report, vol. 66, no. 6, 2017, pp. 153–158.

Additional information on modeling methods, advisory group, and limitations

Model methods	Our model focused on maternal and child outcomes that are linked to PMADs in the literature and recognized by subject matter experts. We initially identified 3,086 articles in our literature review and analyzed the full text of 170 articles that passed title and abstract screening. We ultimately included data from 61 papers, which we selected based on rigor and control for confounding factors.
	We used a cost of illness methodology to synthesize existing evidence and used literature and secondary data sources to inform the model's inputs. We generated model inputs that consisted of three things: (1) impact estimates, which measure the incremental effects associated with exposure to untreated PMADs (versus no exposure to untreated PMADs), (2) the prevalence of PMADs in the United States, and (3) the associated costs and baseline rates of each outcome that is affected by exposure to untreated PMADs, such as preterm birth.
	We applied the impact estimates to the baseline rate of each outcome. We then added the impact estimate (standardized to a percentage point change)—which measures the expected change in outcome because of exposure to PMADs—to the rate of the outcome among the general population so we could calculate the expected rate of the outcome among mothers with a PMAD. For example, the preterm birth impact estimate would measure the incremental risk of a preterm birth to a pregnant mother with an untreated PMAD relative to a mother without a PMAD. Adding this estimate to the baseline rate of preterm birth among the general population would yield an approximate likelihood of preterm birth for mothers with untreated PMADs.
	To calculate the aggregate excess costs of PMADs due to an outcome in a year, we multiplied the individual incremental risk of the outcome with the expected number of mothers with PMADs. We then multiplied the product by the incremental unit cost. We made additional assumptions based on the literature on the rate of recovery from untreated PMADs to extrapolate the costs to the six-year time frame. We then calculated the economic burden of untreated PMADs by summing the costs across all outcomes and years.
Model advisory group	A multistakeholder advisory group provided input on model development and messaging. The group consisted of 17 experts in a variety of fields, including maternal mental health, employment, health care (private and public), pediatric health, public policy, and statistical modeling. We met with the group four times to obtain members' feedback on the model design, inputs, results, interpretation, and value to stakeholders. Advisory Group members included: Annette Bauer (London School of Economics and Political Science), Amritha Bhat (University of Washington), Nancy Byatt (University of Massachusetts), Jamie Daw (Columbia University), Emily Dossett (University of Southern California), Marian Earls (Community Care North Carolina), Rachel Garfield (Kaiser Family Foundation), Huynh-Nhu (Mimi) Le (George Washington University), Julia Logan (Medi-Cal), Barbara Martin (Colorado State Innovation Model), Samantha Meltzer-Brody (University of North Carolina), Jennifer Moore (Institute for Medicaid Innovation), Tyan Parker Dominguez (University of Southern California), Tory Robinson (Blue Shield of California), Brynn Rubinstein (Pacific Business Group on Health), Djora Soeteman (Harvard University), and Michael Thompson (National Alliance of Healthcare Purchasers).
Model limitations	**Restricted time frame.** We designed this model to focus on a six-year time frame (pregnancy through five years postpartum) so that stakeholders could understand the immediate impacts of untreated PMADs. But we recognize that PMADs can have long-term effects on the mother and the child, indicating that our estimates may represent only a fraction of the lifetime costs.
	Costs of treating PMADs. This model does not explore the economic case for intervention or the costs of treating PMADs. Therefore, the model does not incorporate various treatment options nor does it differentiate between inadequate treatment and no treatment for PMADs.
	No primary data analyses. The model uses only inputs from publicly available secondary data and existing peer-reviewed literature. We did not conduct any primary data analyses for the model.
	Nonmaternal caregivers. Although we recognize that nonmaternal caregivers can also have mood and anxiety disorders, such as parental depression, we only modeled the societal burden of maternal PMADs. We also know that others in the household, such as fathers or other caregivers, can be affected by maternal PMADs, but we focused only on the mother-child pair in the model.
	Race/ethnicity subgroup analysis. Although it is important to acknowledge how PMADs affect different racial and ethnic groups, it is not possible to consistently parse out effects of other confounders, such as socioeconomic status, using available literature.